

PC & TECH AUTHORITY

TECH ADVICE YOU CAN TRUST

**BILL
GATES
AT 60**

HOW HE HELPED
CHANGE THE WORLD



YOUR SKYLAKE UPGRAD

**BUDGET
MOTHERBOARDS**

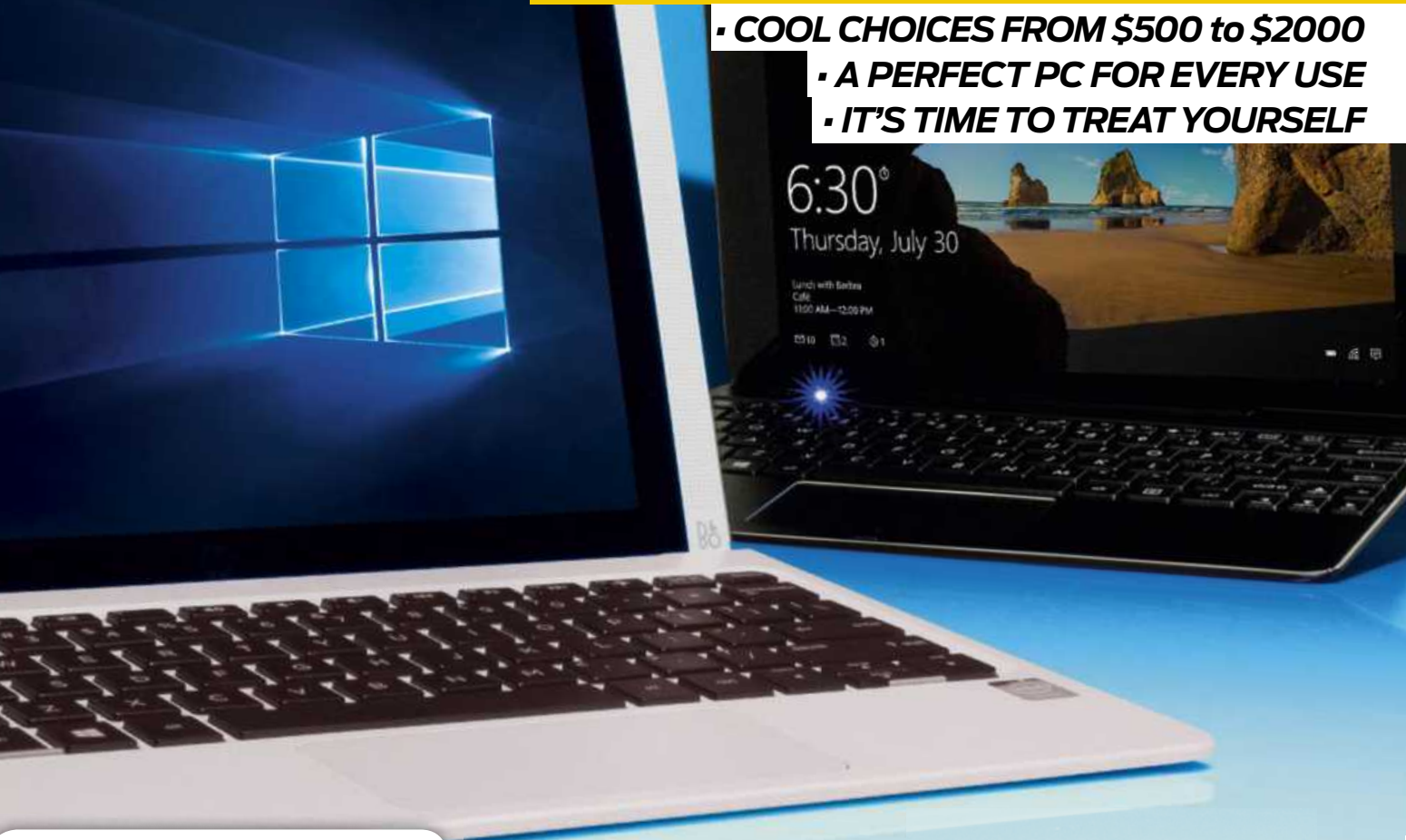
6TH-GEN BOARDS LABS TESTED



BUYER'S GUIDE

Windows 10 LAPTOPS

- COOL CHOICES FROM \$500 to \$2000
- A PERFECT PC FOR EVERY USE
- IT'S TIME TO TREAT YOURSELF



FREE DVD

NOT DEMOS!

- + ABILITY OFFICE V6 - **FULL SUITE**
- + AUTO BACKUP 4
- + SSD FRESH 2015
- + HDR PROJECTS 2
- + SHAMPOO SLIDESHOW STUDIO 2015

HOW TO:

EXTEND YOUR
LAPTOP
BATTERY
LIFE WITH
WINDOWS 10



OFFICE 2016

SHOULD YOU UPGRADE?

ASUS[®]
IN SEARCH OF INCREDIBLE

AVAILABLE IN STOCK NOW



SO VERY SWIFT

 **NVIDIA**
G-SYNC™

165Hz

 **IPS**
Ultra-wide
viewing angle

The World Fastest



Experience the world's 1st 2K / WQHD 2560X1440 IPS G-Sync monitor with incredibly fast 165Hz refresh rate specially designed for gamers.

Best Image Quality



Featuring In-Plane Switching panel technology for stunning 100% sRGB, 16.7 million (8-bit) colours and 178° wide viewing angles.

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Intelligent Ergonomics



Ergonomic design with tilt, swivel, pivot and height adjustments, paired with super narrow 6mm bezel ideal for seamless surround gaming.

ASUS - No.1 Gaming Monitor Brand

*G-Sync requires an NVIDIA GeForce GTX 650 Ti Boost or better,
165Hz refresh requires a GeForce GTX 960 or better

MORE PC

Evolving for you

Without doubt, the most common request we hear from readers is to do more on desktop PCs. And we wish we could! The issue is that we don't feel we could do the industry justice, and in turn, provide you with genuinely useful information, because there are so many shops in Australia selling pre-built systems, and the specs change frequently. I did a quick count, and the top shops like PC Case Gear, Scorptec, Aus PC Market etc each typically have 20-40 models at any one time. Then you have the Dell and HPs of the world.

But! We think we have a solution, and it starts in this issue. After long and careful planning, we're launching a new section in *PC & Tech Authority*. It's called System News, and it begins on page 16. There are two parts to System News, first we will run an overview of the market, and will talk to several of the frontline shop people we know to get a clear impression of what's hot and not. Here, we aim to provide you with a clear understanding of key areas to look at if you are shopping around, and that will include which components offer the best and poorest value. We will look at emerging new components, like new chipset motherboards and graphics cards, with the mission being to arm you with insider knowledge so your guesswork is cut out of the process.

In this first instalment we're looking at DVD drives and discrete audio cards, and to not much surprise have discovered that neither of these are in hot demand. What's most interesting is that the resellers all agree that motherboard audio has improved to the point where discrete audio is largely irrelevant. DVDs are another matter, and we still recommend that

a new build includes one. And not just because we want to be sure that you can enjoy all the freebies included on each month's PC&TA DVD!

The facing page is just as interesting. Because it's impossible to review every single system on sale, we're instead going to spotlight systems that stand out – and they could well stand out simply by being very average. Over the coming months we'll be shifting themes around each issue, and in a given month could focus on budget family PCs, gaming machines (cheap and expensive), and more.

It's all been a tricky thing to put together, and it's something we hope to expand in the future, which can also include doing full reviews of standout examples. I hope you agree that it's a step in the right direction, and your feedback is so very important to us so shoot me an email if you have any comments or suggestions to help us expand and evolve.

Elsewhere it's raining product, as is always the way as we approach the holiday season. Being spoiled for choice is nice, so as the influx of new products intensifies we are doing our best to fit as much in as we can, while still doing a thorough job of the review process.

Until next issue, have fun!



Ben Mansill
Editor

bmansill@nextmedia.com.au

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REAL TECH ADVICE YOU CAN TRUST!

- Our tests are performed by experienced reviewers in our Labs in accordance with strict benchtesting procedures
- Our brand new benchmarks have been tailor-made to reflect real-world computing needs
- We put tech through its paces – seriously. From processing power to battery life, from usability to screen brightness, our tests are exhaustive
- We will always offer an honest and unbiased opinion for every review

THE TEAM...



Digital Editor Tech and Gaming

David Hollingworth
E dhollingworth@nextmedia.com.au
T @atomicmpc



Senior Labs Editor
Bennett Ring



Group Advertising Manager Tech and Gaming

Cameron Ferris
E cferris@nextmedia.com.au



Art Director

Tim Frawley
E tfrawley@nextmedia.com.au

CONTACT US...

ll us (02) 9901 6100

mail us

iox@pcandtechauthority.com.au



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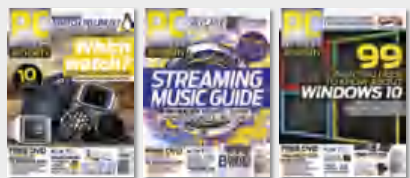
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Office 2016 **26**



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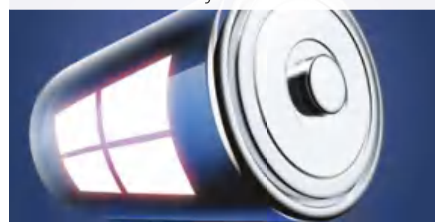
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REVIEW Sony Smart Watch 2

GAMING

SCIMITAR RGB

THE ULTIMATE MOBA and MMO GAMING MOUSE



Key Slider™ control

The exclusive patent pending Key Slider allows 8mm of key slide travel for unmatched customization.



Zero-acceleration optical sensor

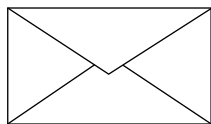
12,000 DPI high performance optical sensor delivers the most pixel-precise gaming experience.



Four-zone RGB lighting

Four customizable zones of brilliant multicolor backlighting deliver nearly unlimited lighting adjustability.





INBOX

Say what?

BANDING TOGETHER

As a mid-fifty year old, not many PC / tech publications are easy for me to read, and most importantly leave me more confused after reading than prior to the experience. I still see your magazine caters for the smart tech group, however you have more than enough articles to keep my level interested, educated and informed - well done, I shall be purchasing again.

I was drawn to this publication re your cover story on "smart watches", really enjoyed your article and in particular pages 58 & 59, comparing them against one another. One quick question, "are the bands extendable or come in sizes to suit Large Wristed People?"

Looking forward to your next edition.

Sean O'Brien

Ben Mansill replies: *Thanks Sean! After testing almost every smart and fitness watch we can confidently say that you shouldn't have any issues. The Apple Watch band, in particular, is very accomodating. Only the Sony Smart Band's metal strap (of many options) could present a problem.*

WHERE'S THE PC IN PC&TECH?

Still no great reviews on desktop set ups (just components as usual). I believe the last IDG figures showed 20% of all computers sold are still desktops, can you give them some mag space?.

You just did a big one of laptops etc in the sept edition. Any chance you can do one on desktops now or add a section on low/mid and high range setups to Kitlog and include some alternative online vendors who make up systems for buyers if you aren't inclined to make one yourself.

Jason

Ben Mansill replies: *Yes! Finally! So sorry it took such a long time to get this going, but as of this month we have the formative steps underway to do just this. I've explained more about what we're doing in my editorial on page 3, but we think we now have a decent solution that will grow and evolve over time.*

CAR GONE!

I'm really enjoying your online news - I never before heard of the Range Rover problem! I myself drive a (petrol) VW, so I'm not affected. It just makes me think about how many vehicles are having problems with software. VW, Audi, Skoda, Seat, Range Rover, Chrysler, the list goes on and on.

Jack Coe

BACK IT UP

Before I start, just let me say great mag. About a year ago I made the decision to reduce the computer tech and gaming mags that I purchased each month to just one magazine. PC & Tech Authority was the obvious winner. The others were too serious or all pictures or just out of touch with the PC world, (in my opinion).

I am hoping you can help me chose a PC backup option. We have four PCs in the house, all running Win10. We have a lot of music, movies, pics and games on these computers, each has its own external hard drive for back up. I don't like the idea of using a cloud service.

I once installed Home server 2011 onto an old computer I had. To test the waters I only connected it up to my laptop. I had it all set up and working well, until a week later, it was hacked.

I have looked online for advice on simple backup options, i.e. only available through my home network as I do not need remote access. But the advice

online seems confusing at best.

Would you please consider doing a piece in your mag on building a simple offline home back up PC, including operating system, security and settings. I also have a WD and Apple TV on this network that I would love to be able to access all our media from all of our Computers from one location safe in the Knowledge that it is secure from the Net.

Andrew

THE PERFECT MONITOR

I'm waiting for a gaming monitor that is 34"+ ultra wide QHD (3440x1440) with 144Hz refresh rate before I upgrade although I believe that there are issues with the limitation of bandwidth that can be delivered through the DisplayPort 1.3 specification.

While it would require high end components to meet those specifications it is important to have something will last quite a few years before having to consider upgrading again.

After running triple-screen monitors for gaming I really think that these monitors will take off and provide a greater gaming experience for those who haven't tried it. Also I think the 3440 pixel width would be better than triple monitor setups due to the excessive stretching on the outer most monitors.

Also, I just bought Doom BFG Edition so that I could replay Doom 3. It used to scare the crap out of me when playing it in a dark room with headphones on.

Rustbucket

Ben Mansill replies: *We are getting very close to perfection. Take a look at our review of Acer's Predator XR341CK on page 43. While 'only' 75Hz, it meets your res and size needs. A G-Sync version with a faster refresh is on the way.*

Want to get in touch?

MAIL: Inbox, Level 6, Building A, 207 Pacific Highway, St Leonards NSW 2065

WEB: pcandtechauthority.com.au

EMAIL: inbox@pcandtechauthority.com.au
Please limit letters to 200 words, where possible. Letters may be edited for style and to a more suitable length.



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TECH NEWS

The latest trends and products in the world of technology

IFA 2015: THE BEST TECH FROM BERLIN

Thousands of products are on show at IFA in Berlin each year - we've toured the exhibition halls to find the devices to watch

It makes us tired just thinking about it: the IFA technology show in Berlin has thousands of products scattered across 150,000 square metres of floor space. We sent a trio of writers to battle past the other 300,000 attendees to bring you this collection of the five best products unveiled during the week in September. While they ice their tired feet, cast your eyes over the very best of IFA 2015.

BEST PHONE: SONY XPERIA Z5 PREMIUM

A 4K television is one thing, but a 2,160 x 3,840 resolution on a 5.5in display is just a little insane. Sony's managed to cram 806ppi into the display on its Xperia Z5 Premium, pipping rivals to the title of first 4K smartphone.

"For the first time in a long time, Sony can boast that it's ahead of the smartphone game," noted reviews editor Jonathan Bray. While most of us would struggle to tell the difference between this

display and those boasting fewer pixels per inch, the images are, unsurprisingly, pinprick sharp. Display aside, the new Xperia features a fingerprint reader and, like its predecessors, is water- and dust-resistant. Add in 3GB of RAM, 32GB of storage, a microSD slot and a 23-megapixel camera, and it's easy to see why this is the handset of the show.



BEST SMARTWATCH: SAMSUNG GEAR S2

Samsung's Tizen OS smartwatches have thusfar only worked with selected phones. Until now. The latest wearable from the tech giant sees the OS open up to Android, working with any recent phone on the Google platform that includes more than 1.5GB of RAM.

And that's just the software. Samsung has opted for a round watch face with a rotating bezel for navigation, similar to the digital crown on the Apple Watch. It features the usual fitness and health apps, and the 3G version of the watch even lets you order an Uber cab with a tap on your wrist - even if your smartphone is at home.

"The rotating bezel looks like a genuinely good idea, and the quality and finesse of the design may be enough to draw focus away from the increasing number of gorgeous high-end wearables," said Jonathan Bray.

BEST PC: ACER REVO BUILD

The Revo Build's stackable, modular design makes it easy to upgrade.

That means you can buy the mini PC, then add on extras such as a hard drive, external GPU or speakers simply by stacking them on top of the base, while a discrete connector carries power and data between the blocks. "Imagine if an Intel NUC had an illicit love affair with a box of Lego: their lovechild would surely be the Acer Revo Build M1-601," said Sasha Muller, life and culture editor. That's not a sentence we thought we'd ever read in this magazine, but we're pleased to hear creative PC design isn't dead.



BEST HYBRID: LENOVO MIIX 700

If Microsoft's Surface Pro 3 appeals to your heart but not your wallet, Lenovo's take on the Windows tablet-cum-laptop might win over both. The Miix 700 looks similar, even sporting a kickstand hinge, but won't put such a dent in your credit limit.

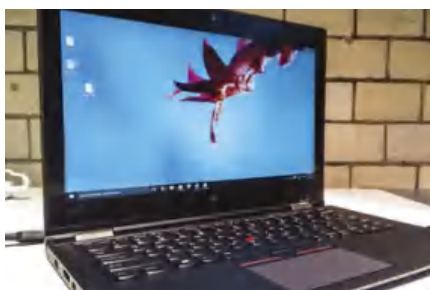
Part of the price difference is due to performance, with the Lenovo version



running Intel's Core M chipset rather than the more powerful Core iX chips, but the former should offer longer battery life. "Hopefully with Lenovo now daring to draw cues from Microsoft's school of design, other manufacturers will do so too," said Vaughn Highfield, staff writer, adding: "In time we could see a revolution in hybrid tablets, allowing us to burn hateful and dated clamshell designs and rigid, plastic Bluetooth keyboards in a ritualistic fire."

BEST LAPTOP: LENOVO THINKPAD YOGA 260

We didn't only hang about the Lenovo stand, though there certainly was good reason to: our favourite laptop also came via the Chinese manufacturer. As the name suggests, this laptop combines the ThinkPad's business-focused design with the flexible hybrid features of Lenovo's Yoga line, including Intel's Skylake chips, the latest SSD tech, including the NVMe Express (see What is...NVMe?, right), and new active stylus technology. "Imagine a ThinkPad X1 Carbon that's had its DNA spliced with a Yoga, and then been hit with a shrink ray for good measure: you're now looking at the ThinkPad Yoga 260," said Muller, adding that it's a "business laptop worth getting excited about". This ThinkPad will, unusually, also come in both black and silver.



WHAT IS... NVME

Samsung's 950 Pro SSD quadruples its predecessors' read speeds, thanks to a new interface technology. Here's how it works

SSDs are set to get even snappier. Samsung unveiled its fastest consumer SSD yet, thanks to a new interface technology called NVMe, which takes full advantage of the combination of NAND flash memory and PCI Express.

NVMe? It sounds like a terribly named boy band.

It actually stands for Non-Volatile Memory Express, which is a new host controller specification. It's an alternative to the Advanced Host Controller Interface (AHCI) that's used in most SSDs, despite the fact it was originally developed for mechanical hard drives. Why? It capitalises on the low latency and parallelism of SSDs with PCI Express. AHCI can have one queue for commands, while NVMe can manage 65,000. Plus, it requires only one fetch for command parameters, rather than two in AHCI.

How fast are we talking?

The 950 Pro boasts sequential read speeds of 2,500MB/sec and write speeds of 1,500MB/sec – which is quadruple the read speeds and triple the write speeds of the 850 Pro. Random reads top 300,000 IOPS (input/output operations per second), while write speeds are



110,000 IOPS. All of that is grand for enterprise workloads, but client PCs will also benefit from performance gains, as they will help extend battery life.

Are those speeds all down to NVMe?

No, the interface spec is designed for use with PCI Express, so the SSD is also seeing a performance boost as it features a PCI Express 3 rather than a SATA interface.

What's the downside?

Who mentioned that there's a downside? Alright, there is one. While NVMe already has wide driver support, that's not true for BIOS support so, depending on the motherboard you have, you won't be booting from an NVMe drive without a firmware update.

And when is this SSD hitting shelves?

Samsung's 950 Pro SSD has just arrived, with a 512GB version costing around \$530. We will publish a review as soon as we can, but Samsung hasn't wanted to provide a review sample at this stage. However, the Samsung model can't claim to be the first commercial NVMe SSD – that award goes to Intel, which has released its own version, the 750 Series.

IS AD-BLOCKING LEGAL - OR ETHICAL?

Should you be allowed to block ads? Advocacy groups such as Get Shine argue it's a human right. It's not only about irritation, of course. On mobile devices, the bandwidth involved in downloading ads not only slows load times, but eats through data allowances.

On the other hand, that's the cost you pay for "free" content. Tumblr and Instapaper co-founder Marco Arment made an ad blocker for iOS 9 called Peace, but pulled it within days after it became the best-selling app in the Apple App Store, saying it "just doesn't feel good" to prevent sites from earning revenue.

Such questions aren't only for ethical web users, but the courts. Publishers and

advertisers last year sued Eyeo GmbH, the creator of Adblock Plus, in the German courts. The companies behind sites such as Zeit.de and Wiwo.de claimed for injunctive relief, arguing that Adblock Plus shouldn't be allowed to interfere with ads on their websites. The case was dismissed, with the



court ruling that Eyeo did not have sufficient market dominance to prevent sufficient numbers of users from seeing ads.

While the blockers won that round, there's the growing possibility that more publishers will thwart them by other means. Sites can already demand that ad blockers are switched off in order to access material – something Channel 4 already does it for on-demand content. Google accidentally did so via a bug in YouTube, with ad blockers failing to prevent pre-roll ads and removing the "skip advertising" button.

It may have been a bug, but it's clearly technically possible, and may be one way forward in what's set to become an advertising arms race.

GAMING NEWS

For the fun

INTERVIEW TRIAD WARS

Triad Wars, the follow up to Sleeping Dogs, is taking a very different direction and we caught up with one of the game's directors to find out what it's all about

We can't think of many sequels (well, prequel, really) that have completely changed up the genre of a game like Triad Wars does for Sleeping Dogs. Why move away from single player to online multiplayer?

Steve Ferreira: Because we wanted to do something new. Sleeping Dogs takes every player along the same linear journey to a finite endpoint and then the story is done, and everyone stops playing. It's a good game, but it's the sort of game you've played before. It's conventional. What we're making with Triad Wars is a persistent multiplayer online crime sandbox. We took the living world we built for Sleeping Dogs and made a new game in it. A game that people can keep playing, without a defined endpoint, where players can compete and fight their way to the top of the Hong Kong underworld. That meant putting that world online and making it free-to-play so it would be populated with lots of people, to make getting on top and staying on top a real achievement, and not just passing some set target in a static game.

United Front has said it's a game you've always wanted to make – what's stopped you in the past?

There's no way we could have made this game had we not started with Sleeping Dogs as a foundation. By using Sleeping Dogs as a base we got all if it's ambient systems, the police, the traffic, the weather, the pedestrians, etc. We also got the Sleeping Dogs combat system, which gives us high energy Hong Kong cinema style kung-fu and gunplay. Add to that the rich backstory and characters. Triad Wars gives us a chance to explore their origins, to let you meet Winston and Dogeyes and Big Smile Lee when they were working their way up, and claw your way past them. So, without Sleeping Dogs we'd probably need five more years of development to get to where we are.

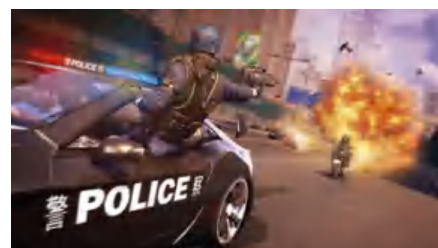
Given the wider scope of the game, whave you had to 'dumb down' any of the mechanics and systems of Sleeping Dogs?

We've done the reverse actually. Sleeping Dogs needed to hold its audience until the story was done but Triad Wars aims

to keep people over the long term. That means Triad Wars has to be a much deeper game, so we're busy adding new moves, new combat styles, new challenges and new mechanics. As a free-to-play game Triad Wars needs to be more accessible initially; we want as many people as possible to give it a try so our intro sequence won't challenge any veteran players, but once you get into it the difficulty ramps up for those who choose to challenge themselves. To cater to a bigger audience we've structured gameplay so players can choose their own objectives, and so their own difficulty, moment by moment. For those who want an easier time they can bail on a raid whenever they like, but their rewards will reflect that. For those with the skills, their raids are longer, harder, and much more rewarding.

Currently the game features what you're calling 'asynchronous multiplayer', where you don't really interact with other players, but rather you do so by proxy. Are there plans for actual multiplayer modes, ala GTA Online, at any point?

Yes! Here's the plan: we're adding Triads, which are like player-run clans or guilds. Then we're going to let players within Triads help defend one another, so if you're in my Triad and some stranger comes along and attacks me, you're enforcer will help defend my turf. This will make raiding top players, and top triads, much harder. Then we're going to add co-op raiding, so you and a friend can play together in real time to take down player's base you couldn't handle on your own. And then we're adding a meta-game within the game where Triads compete for control of the city, the real Triad Wars.





The best Windows ever for gaming.

Gaming just got even better with Windows 10. Not only do your existing games work great, but now you can play and connect with gamers across Xbox One and Windows 10 devices. From the best casual games to a new generation of PC gaming, Windows 10 is built for the games you love.

*Games and media content sold separately.



CHIP NEWS

Nvidia didn't invent the GPU, AMD about to go bust, water in your CPU and dual GPU double vision. **Mark Williams** covers this month's crazy chip news

CPU

AMD ON THE BRINK

It seems that despite putting on a brave face and launching new products regularly, AMD is in a world of pain behind closed doors with a slew of bad news coming from the company this past month.

The biggest news is that yet another top engineer has left the company. Phil Rogers having been part of AMD and formerly ATI for 21 years has moved on to Nvidia to take up the role of Chief Software Architect for Compute Servers. Rogers was basically the guy that forged AMD's Fusion initiative which ended up turning into the (Heterogeneous System Architecture) HSA Foundation.

In more bad news, during AMD's recent third quarter earnings report it detailed that once again it had lost money, to the tune of \$197 million, its fourth straight quarter loss.

In an effort to stem the bleeding, AMD announced that 5% of its workforce (500 jobs) will be cut and that its assembly and test operations (everything done to CPUs after the

silicon die has been manufactured) will be spun off into a joint venture with Nantong Fujitsu Microelectronics who will then receive 85% ownership of those assets in return for \$371 million in cash.

To top it all off AMD are also hunting around for capital investors. Allegedly AMD was in talks with Silver Lake Partners, a private-equity fund, to sell off a 25% stake of itself to the firm. However after not being able to come to a monetary agreement or future strategy for the company, the deal fell through.

With AMD shares down 38% for the year to date it seems they are banking everything including the kitchen sink on Zen to remain in business.

LIQUID COOLING IN YOUR CPU?

Ever since Intel and AMD introduced the Integrated Heat Spreader (IHS), effectively a metal plate, on top of their processors to protect the dies from cracking under heatsinks, top overclockers have been removing (de-lidding) them to once again gain direct

heatsink contact onto the core of the CPU die, thus attaining peak cooling performance.

But what if you could cool the die from within? And not even requiring a heatsink?

That's exactly what a DARPA funded team have managed to achieve. Revealed at the IEEE Custom Integrated Circuits Conference it was shown that using FPGA (field-programmable gate array) chips they were able to cut microfluidic channels into the die itself just a few hundred microns (around four human hair widths) from the transistor logic itself.

This allowed the team to cool the chip down to 24°C which when using a regular heatsink fan was only reaching 60°C.

They have also demonstrated that the technique can be used on current day CPU and GPU designs and that it also opens up the possibility of die stacking high performance parts together. Further aiding the miniaturisation and compactness of future chip designs.

GPU

DOUBLE DUAL CARDS INBOUND

The next major graphics releases we will see are the monster dual GPU halo products from both Nvidia and AMD.

Word on the street is that Nvidia already has its dual GM200 cards ready to go and are waiting for AMD to make their move first before showing its hand. At this stage though nothing else is known about Nvidia's card.

AMD's contender however we know a few more scant details about. It's codenamed Gemini and will sport a similar CoolerMaster AIO liquid cooling solution to the Fury X cards. We also know it will likely cost about the same as the R9 295 X2 at launch, about \$1500 retail.

With Gemini units having been produced now too, it seems it's a waiting game to see who blinks and launches first, the benefit of launching second being that you can tweak your cards

specs or price slightly before launch to better compete. First impressions matter.

GEFORCE 256, NOT FIRST OF ITS KIND

The Geforce 256 was launched by Nvidia way back in 1999 and in an International Trade Commission court case against Samsung and Qualcomm was claiming that it was effectively the first modern GPU, defined as "a single-chip processor with integrated transform, lighting, triangle setup/clipping, and rendering engines that are capable of processing a minimum of 10 million polygons per second".

Nvidia was claiming that Samsung's Exynos and Qualcomm's Snapdragon processors infringed on three of its patents.

The presiding judge determined that two of the three patents were not infringed upon but the third was being

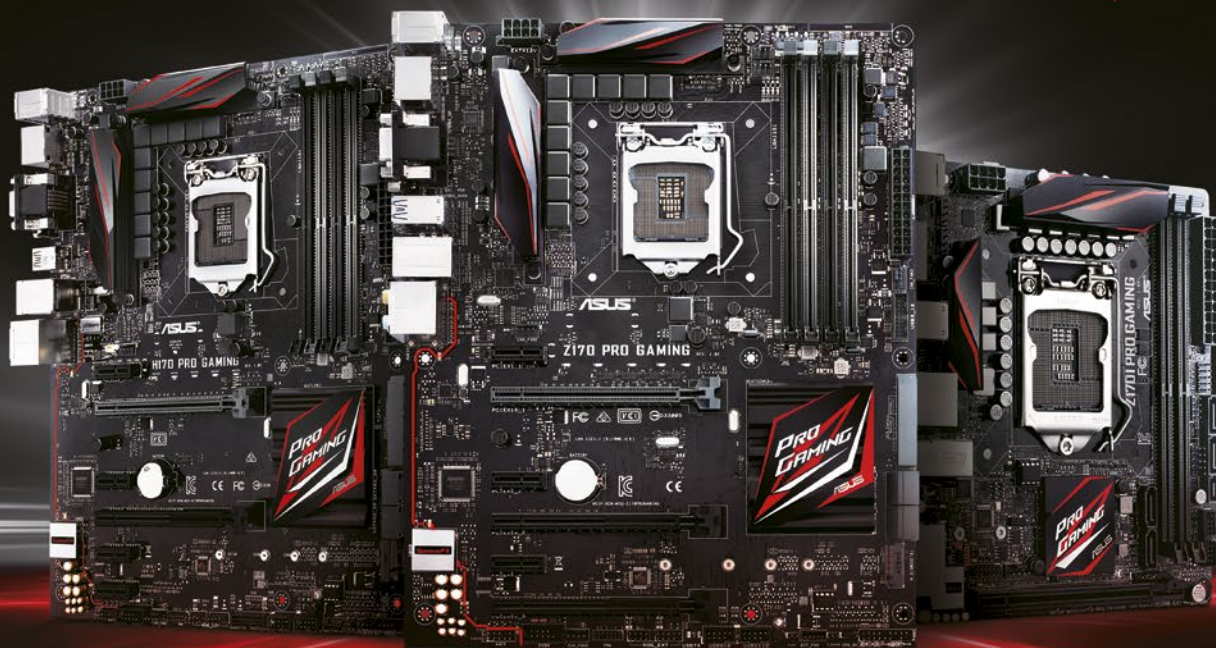
infringed by Samsung. However the related patent was deemed to be invalid because it was not a new invention compared to previously known patents, so was thrown out.

This now leaves Nvidia with a bunch of counter suits from Samsung filed against it back when Nvidia fired the first legal shots.

▼ The experimental FPGA die with water cooling running through it



Credit: Rob Felt, Georgia Tech



ASUS PRO GAMING SERIES MOTHERBOARDS PLAY YOUR STRENGTHS



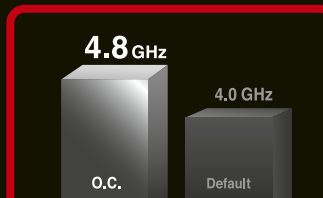
Flawless Audio

Experience near-lossless gaming audio with a 115dB signal-to-noise ratio from SupremeFX's fantastic Realtek[®] ALC1150 codec, plus premium shielding, an effective electromagnetic-interference cover and Nichicon capacitors for flawless audio.



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Play faster with tournament-level Intel[®] Ethernet, minimizing CPU use and maximizes TCP and UDP throughput. Plus 2.5X-greater LANGuard surge tolerance, and packet-prioritizing GameFirst for pumped gaming bandwidth and low pings!



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* Overclocking range varies according to CPU capabilities, cooling, motherboard support and tuning options.



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The **BEST** Motherboard Brand **B**reakthrough - **E**asy to use - **S**table - **T**rusteds

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MOST WANTED

Rob North sifts through the latest and greatest tech and gadgets this month so you don't have to

Google Chromecast Audio

Yep, you read that right. Coinciding with the release of its updated super cheap and effective media streaming solution that can make your dumb TV just that little bit smarter, Google has gone ahead and decided to release a version exclusively for those looking to play music from smartphones and other devices, and it's brilliant.

MOST WANTED: If you have a solid speaker system at home picking up a Chromecast Audio is a no brainer. The small circular device, styled like a miniature vinyl record and priced at just \$49, plugs into a 3.5mm input and from there it's more or less ready to rock and roll.

NOT WANTED: That being said Chromecast Audio is hardly the revolutionary device its televisual counterpart was and is. With the widespread availability of wireless Bluetooth speakers you may have already solved your audio streaming problems. Plus, iOS users are going to feel more than a little shafted, with no support for iTunes or Apple Music.



Silverstone Raven RVZ02 case

It's been about a year since the release of the super compact mini-ITX Silverstone Raven RVZ01, arguably one of the best cases for a living room PC build. You'd think that'd be a hard act to follow for the Raven team, right? Think again.

MOST WANTED: The Silverstone Raven RVZ02 is beautiful to look at, and the internal design ain't too shabby either, with tool-less drive cages for hassle free installation and room for a full length 13 inch graphics card. It's also 15% smaller than its predecessor.

NOT WANTED: If you've already got a primary gaming rig elsewhere in the house you probably won't be too fazed by this, but unfortunately due to the smaller form factor there isn't any room for a case fan, meaning it's more suited for a mid-range rather than top-end build.

AfterShokz Bluez 2S

While to the everyman, bone-conducting headphones probably sound more like a shonky second-rate torture device than something worth getting your head around (or getting around your head, if you will), seasoned wearers of these nifty contraptions can't seem to get enough of them - and with the release of the AfterShokz Bluez 2S neither can we.

MOST WANTED: This is an update to the already fantastic wireless Bluez 2 model, with additional tech and a few minor design changes intended to improve audio quality. The headphones vibrate the bones just in front of your ears, leaving your eardrums totally free to hear everything that's going on around you perfectly. The lightweight headband-like design makes AfterShokz headphones perfect for those exercising in high-traffic areas.

NOT WANTED: They aren't the cheapest headphones on the market, priced at US\$99.95, and if you've already got the previous model it's going to be hard to justify an upgrade at this stage.



HUDWAY Glass

The availability of heads-up displays for navigation while driving confirms we're living in the god damn future. Unfortunately, it turns out the future is also god damn expensive. Enter HUDWAY Glass.

MOST WANTED: HUDWAY Glass is a simple smartphone accessory that projects a heads-up display with directions, speedometer and other info onto a curved piece of glass, making it safer and easier to view this information while keeping an eye on the road, and is compatible with any application that has a HUD mode.

NOT WANTED: Granted, this is an awesome concept, and extremely affordable (you can pick it up by pledging \$34 or more to its Kickstarter) but keep in mind it's light projected onto glass, so we'd be interested to see how it holds up in extreme sunlight and how distracting rather than it is in low-light conditions.



Bose Solo 15 Series II

The Bose Solo 15 Series II is essentially the conservative man's home theatre audio solution; a slim black rectangular box (measuring 62.9cm long by 35.6cm, and 7.6cm high) that does just what it promises. It makes good sound - sound good?

MOST WANTED: The Bose Solo 15 Series II features five drivers for a full-on all-encompassing sound experience, with a centre speaker dedicated to dialogue so you'll hear all the syllables and utterances you might have otherwise missed. What's more, when you're not watching the idiot box you can hook it up to a Bluetooth enabled device to blast some tunes without the need for a separate wireless speaker around the house.

NOT WANTED: It's demure design and features make it a worthwhile consideration if you're looking for a new speaker or soundbar, but at \$649.00 the old sledge 'BOSE: Buy Other Sound Equipment' comes to mind.



BLOCKS Modular Smartwatch

BLOCKS Modular Smartwatch has been dubbed the wearable equivalent to Google's Project Ara - a flexible future-proof device that'll let you swap in and out individual features depending on what you want and need at any given time.

MOST WANTED: Following the completion of its Kickstarter campaign, where at the time of writing it had already accrued over \$700,000 in backing on a \$250,000 goal with 35 days to go, four modules will be available: extra battery, heart rate, GPS, NFC, and 'Adventure Mode' (altitude, pressure and temperature). The UK based startup is also already working on SIM card and fingerprint modules, with a camera module flagged as a potential future possibility.

NOT WANTED: Unfortunately given that the attachable modules act as the watch strap picking and choosing what features you want will be a necessity, with BLOCKS claiming the average user will be able to wear four modules at a time.



Adonit Jot Dash

The Jot Dash is the latest stylus from third-party manufacturer Adonit, and it's as simple as it is wonderful, providing a relatively cheap input device for those looking for a bit more precision as well as those unwilling to release their firm grip on the pen and paper past.

MOST WANTED: Following the good old 'keep it simple' maxim, Adonit has put together a stylus that looks and feels a hell of a lot like an old-school pen. It's lightweight, about the thickness of a standard biro, and best of all works with any capacitive touch screen device (excluding Windows devices) and pretty much any app natively by forgoing Bluetooth connectivity and instead using electronics to mimic the impulses generated by your fingertips.

NOT WANTED: It might not bother some, but the lack of pressure sensitivity is a bit of a letdown.

System news

MARK WILLIAMS TAKES A LOOK AT WHETHER TWO OFTEN OVERLOOKED SYSTEM PARTS ARE STILL WORTH IT OR EVEN RELEVANT ANY MORE

Ten years ago, the discrete sound card and DVD burner were must-have parts of any new gaming system build. What audio capabilities your motherboard had, if it had any at all, were rubbish and with broadband still in its infancy at the time with now laughable download quotas and USB sticks still in the single-digit gigabyte range, DVDs were still a cheap viable way to move large chunks of data on and off your PC.

OPTICAL ILLUSIONS

These days with cheap USB 3.0 connected thumb drives, HDDs and even SSDs, not to mention cloud storage services via ubiquitous broadband and for those lucky enough, the NBN, the optical drive has fast become some what of a relic.

Aside from the booty of free software on this magazine's disc, just about the only reason to have an optical drive now is for playing Blu-ray movies, but even then, with Netflix in Australia and a multitude of other streaming services, the Blu-ray might be the shortest lived optical disc format ever.

SALES SILENCE

Discrete sound cards like Creative's Sound Blaster Z and Asus' Xonar series are surprisingly in a similar boat.

Motherboards have definitely stepped up the game in the last couple of years by now partitioning off the audio subsystem on the PCB from the rest of the motherboard to avoid as much as possible electromagnetic interference from ruining your aural experience.

They also offer much of the experience



▲ DVDs, what are they good for? The PCTA cover disc, that's what!

and sound quality that the majority of users could ever need, including surround sound, optical outputs, dedicated high quality headphone circuitry and even switchable OP-AMPs.

Part of the problem is that audio is very subjective. Everything else can be benchmarked to show faster loading times or higher FPS, but with sound it comes down to each individual user as to how good something sounds. And according to our experts, the verdict is in – on-board audio is good enough for most users. All the outlets we spoke to reported that discrete sound card sales had basically flat-lined with zero or single digit numbers sold in previous months.

On the other hand, discrete sound cards do still offer more customisation and configuration options on the software front and some of the higher end options even provide breakout boxes for a multitude of extra I/O options that on-board just can't compete with at the moment.

For audio enthusiasts and audiophiles, discrete cards are still very much worth the expense but for everyone else it's time to move on.

▼ Sound cards. Who needs them? Well, some demanding gamers, but almost nobody else.

SHOP TALK

Our question this month: "are optical drives and discrete sound cards still relevant for desktop PCs? Do you still include these in pre-built offerings and why?"

Michael, Aus PC Market:

"No-one is buying systems with discrete sound cards any more - neither ones that customers put together from parts they pick themselves, nor systems that we offer pre-configured on our site. The Realtek onboard audio chipset from the motherboard vendor has triumphed in this area, and as a result I can't recall the last time I ordered a sound card. We built a \$14k PC for a gamer last week, and that didn't even include a sound card.

The professional audio users, who would constitute the rest of the sound-card marketplace, tend to buy specialist sound cards that cost as much as a PC itself, usually from dedicated audio resellers rather than PC shops."

John, TI Computers:

"I believe optical drive is still an essential part of a desktop system. The reason being that bundled drivers and software are mainly supplied in the form of an optical disc, even when internet download became an option, they are still not be as accessible as a few simple clicks on the disc menu. Keep in mind that the removal of EHCI and OHCI protocol support in the Skylake platform also leads into the difficulty of not being able to install operating system without native XHCI support (such as Windows 7), hence why we believe it is still essential to have an optical drive in a desktop system."

Scott, PC Case Gear:

"Motherboards have definitely come a long way - even offering built in headphone amplifiers -- so sound cards need to offer a lot more to stay relevant. We are actually seeing a steady rise in external DACs like the Audioengine D1/D3 and Asus Xonar external models. This makes a lot of sense, as no matter how much shielding is in the motherboard's on-board sound or a discrete card - it's still located inside a box full of electrical interference! Taking the DAC process out of the PC makes a lot of sense and is typically more convenient, so we are expecting to see this trend continue for anyone looking for an upgrade over the on-board sound. The market for a dedicated sound processing solution still exists - but there is no denying it has dropped off significantly in recent years.



Market snapshot

A SAMPLING OF NOTABLE PC SYSTEMS AVAILABLE IN AUSTRALIA THIS MONTH

A SOLID GAME BOX

J&W Computers GMR Zeus Advanced Gaming System

\$2199 · <http://tinyurl.com/JWZeus>

This is a solid entry for budding enthusiasts to get their chops around something with a decent amount of gaming grunt, which they can overclock without breaking the bank. Nothing in this system is particularly new to market, or is high end but are definitely notable with the price/performance sweet spot in mind.

The case is over three years old, and even back then wasn't marked well for its aesthetics or thermals, but with lots of expansion for more fans or dual radiator setups this can be worked around. The system will come with a random H97 motherboard, so you might want to ask first if you can pick the brand/model to ensure you get the features you want.

KEY SPECS

CPU: Intel Core i5-4690K
Cooler: Corsair Hydro Series H80i
Motherboard: H97 Chipset Motherboard
Graphics: AMD Radeon R9 390 8GB
Memory: Kingston (2 x 8GB) DDR3-1866MHz HYPER X GAMING
Storage: 240GB SSD + 2TB HDD
Power Supply: FSP Hyper 700W (HP700S)
Case: Corsair Vengeance C70



BASIC WORKHORSE

Scorptech Computer AMD A6 Office PC

\$599 · <http://www.scorptec.com.au/systems/scorptec/1/276>

This cheap office PC solution is just enough to let you wrangle some fancy spreadsheets and send emails. AMD CPU's are quite rightly looked over mostly these days, however in these budget categories they can still compete well. The shining star is definitely the business grade Samsung SSD, but at 120GB and being the only drive, storage space will be a premium but it should be more than enough for basic office work.

The only other concern is the 4GB of RAM, browsers with several tabs, Outlook and a large spreadsheet or two open may have you occasionally paging out to the SSD. Beware no operating system is included.

KEY SPECS

CPU: AMD A6 7400K
Cooler: OEM
Motherboard: Gigabyte GA-F2A78M-HD2
Graphics: Onboard
Memory: Corsair 4GB (1x4GB) 1600MHz DDR3
Storage: Samsung 650 Series 120GB SSD
Power Supply: Thermaltake 500W PSU
Case: Thermaltake Versa H21



GAMING DREAM MACHINE

PC Case Gear Battlebox 980 Ti SLI Gaming System

\$4999 · <http://tinyurl.com/pccasegearbattlebox980>

Battlebox indeed. I'd rename this the Star Wars: Battlefront box. With the Stormtrooper-esque white with black touches everywhere and the green lighting all around as if Skywalker's light sabre is hiding inside, this system stands ready to take you to Hoth or the forests of Endor with ease.

From the motherboard to the cable sleeving to the light on the cooler, it's incredibly well colour co-ordinated.

And to match the looks, and price, is some serious hardware inside. The latest top end Skylake CPU, SLIed GTX 980 Ti's, large SSD and 32GB of RAM. This is a system Yoda himself would drool over.

KEY SPECS

CPU: Intel Core i7-6700K
Cooler: Corsair Hydro Series H100i GTX
Motherboard: MSI Z170A XPOWER Gaming Titanium Edition
Graphics: 2x EVGA GeForce GTX 980 Ti Superclocked+ ACX 2.0+
Memory: 32GB Corsair Vengeance LPX CMK32GX4M4A2400C14 DDR4
Storage: Samsung 850 EVO 500GB SSD, Seagate 2TB HDD
Power Supply: EVGA SuperNOVA G2 Gold 1000W
Case: Phanteks Enthoo Luxe White



The \$400 BOX

Mwave Australia Intel Dual Core Essential

\$399 · <http://tinyurl.com/mwaveessential>

This is about as basic a computer as you can buy. The dual core Celeron processor is matched with a motherboard sporting decent connectivity with up to six USB 3.0 ports and a 16x PCI-E slot should you feel the urge to drop in a mid-range graphics card later.

For storage a 1TB hard drive and an included DVD burner live up the essentials name of this system.

One nice feature is the included Wi-Fi-N spec adapter which will certainly give you more networking options.

No operating system is included however, so bear that in mind if watching your pennies.

KEY SPECS

CPU: Intel Celeron G1840
Cooler: OEM
Motherboard: Gigabyte GA-H81M-S2H
Graphics: Onboard
Memory: Kingston ValueRAM 4GB DDR3 1600MHz
Storage: Seagate 1TB HDD
Power Supply: Thermaltake Litepower 450W
Case: Thermaltake Versa H15





SO THIS IS CHRISTMAS... TIME TO RE-GIFT?

Anthony Caruana is a gift to consumers

Ahhh...Christmas. A time for family, fun, laughter and sharing the spoils of the year with rampant gift giving. And then there's Boxing Day – a time for relaxing, eating leftovers and working out what you'll do with the gifts you pretended to like but really didn't.

Is it acceptable to take unwanted presents back to retailers for an exchange or refund? Or should you keep them, rewrap and pass on to someone else? What about selling them via eBay, Gumtree or some other online site? And, social convention aside, are there any other gotchas?

BE HONEST AND POLITE

OK – so you weren't happy with the fluorescent pink neoprene smartphone case with the tasselled wrist band. You can put on a fake smile and start mentally plotting your revenge for next Christmas or you can say "it's not really my thing. Where did you get so I can exchange it for the Batman case I've been eying off?"

Aside from not being dishonest, you might have a crack at getting the receipt so an exchange or refund is easier to negotiate at the store.

When you go to the store, particularly in the days immediately after Christmas, staff are ready for the onslaught of returns. If you're returning an unwanted gift, we've found telling the truth rather than concocting a story about how it's the wrong model helps.

Many retailers will gladly exchange items or provide store credit if you tell them the truth.

According to the ACCC's guidelines,

it's lawful for retailers to refuse a refund or exchange on the basis that buyer has changed their mind. In effect, when someone buys you a perfectly functional gift you don't like there's no defect or reason for the item to be returned.

In other words, just because you don't

“and let's not even start on blister packs that require an angle grinder and engineering degree to dismantle”

like the gift, there's no legal reason the retailer is obliged to refund or exchange the item.

Manners go a long way. If you're returning an unwanted gift, be polite to the sales staff. They aren't under any obligation to take back an unwanted item. Being polite and honest will make the interaction easier and increase your chances of success.

RECEIPTS MATTER

In order for a retailer to offer a refund or exchange it's reasonable for them to expect proof that the item was purchased from their store. That means having a receipt is very helpful.

If you're planning to exchange an item, politely ask the gift-giver for the receipt. It will make life easier at the store.

DON'T OPEN THE PACKAGING

If you receive a gift you know you don't want, make some convenient excuse – “I want to open it at home and really savour the moment” is a good one – so you don't have to break the shrink wrap.

Also, many items are really hard to repack with all the cardboard and polystyrene inserts some companies are obsessed with using. And let's not even start on blister packs that require an angle grinder and engineering degree to dismantle.

A brand new product, in its original packing is much easier to return or resell.

DON'T WAIT TOO LONG

If you're planning to return an item to a store for exchange or refund, we suggest doing it promptly.

Many retailers stock specific products at specific times. You might find it difficult to return a product to a store if they no longer stock it.

AUCTION SERVICES

Reselling unwanted items is what eBay and other auction sites are, or at least were, all about.

In order to maximise your chances of a successful sale, visit the product web site and track down some great product shots and an accurate description and set of product specifications.

As well as being helpful for potential buyers it will cut down on the number of questions you'll get.

The same rules apply for direct sale sites such as Gumtree and Trading Post.

GIFT CARDS

If you've received a gift card such as a Google Play Store, Apple App Store or other currency card, then a refund isn't likely to be possible but if your household is anything like ours, some horse-trading is on the cards.

Find a friend who uses the cards to you have simply sell the card to them directly.

Again – timing is critical. In Australia gift cards have expiry dates so trying to offload an unwanted card at short notice can be tricky.

NEED HELP? EVER HAD AN ISSUE AS A CONSUMER? INVESTIGATOR CAN HELP.

If you've had an issue or had something happen and you think investigator could help, email your problem to investigator@pcandtechauthority.com.au



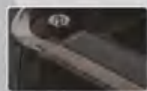
Anthony Caruana

has worked for almost every major masthead in the Australian IT press. As an experienced IT professional – having worked as the lead IT executive in several businesses, he brings a unique insight to his reporting of IT for both businesses and consumers.

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Multi-GPU



GAME BOOST



MOTHERBOARD

Z170A XPOWER GAMING

TITANIUM E D I T I O N

DEALER INFO

VIC

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EVA Tech
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f MSI Australia



Bill Gates at 60

HIS TEN MOST DEFINING MOMENTS

IN SIX REMARKABLE DECADES, BILL GATES HAS LAUNCHED THE WORLD'S LARGEST SOFTWARE COMPANY AND SAVED COUNTLESS LIVES.

IAN BETTERIDGE CHARTS
HIS HIGHS AND LOWS



On 28 October 2015, Microsoft founder Bill Gates turns 60. During his life he's been many things: a precocious student, an aggressive founder of a huge company, a super-smart coder and now a philanthropist aiming to rid the world of malaria.

What's been consistent in everything Gates has done, though, is his drive and will to succeed. As a businessperson, Gates looks to the outside world as if he knows no fear, taking on competitors, the US Department of Justice and now a disease.

There have been many moments in Gates' life that have shaped not only his future, also that of the computer industry. No sin person - not even Steve Jobs - has made a bigger impact on computing. Arguably, Gates' work has affected more people than any other person in the 20th century.

We've picked out the ten moments we think encapsulate Bill Gates, both good and bad, and his impact on the world.

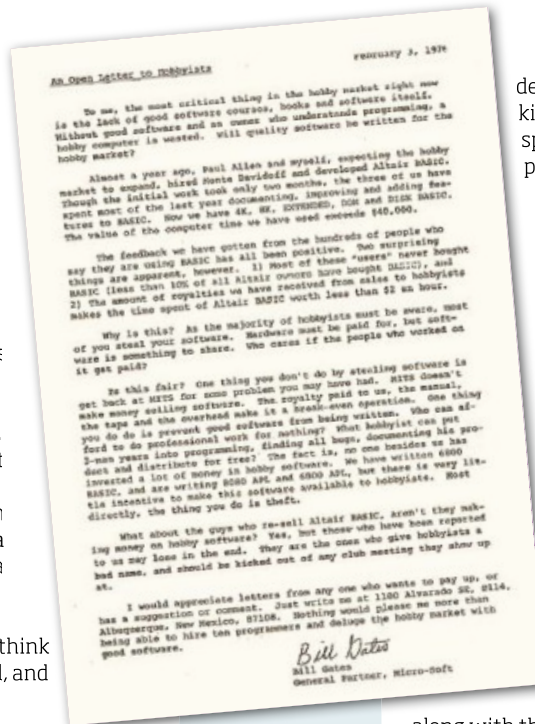
1975 GATES STARTS MICROSOFT

Although they didn't register the trademark until the following year, by the age of 20 Gates and school friend Paul Allen were already running Microsoft - or rather "Micro-Soft", as they were calling it at the time.

The two, who had been friends since school, had been obsessed with computers at a time when they were the size of cars and you worked with them remotely via teletype.

Fortunately, they went to a school that had the funds to install a teletype for computer access - a rarity in the 1960s - although pupils had to pay for computer time over and above their "free" allocation. Allen was so obsessed that, as Gates revealed in a 1995 interview with Time magazine, he wasn't allowed to graduate until his parents had paid off the \$200 bill for extra computer time.

Gates and Allen had already started another company before Microsoft, called Traf-O-Data, but it was the opportunity to create a version of BASIC for the Altair 8800 from Micro Instrumentation and Telemetry Systems (MITS), which the magazine Popular Electronics



▲ Bill Gates' famous open letter was published in the newsletter of the Homebrew Computer Club

described as the "world's first minicomputer kit to rival commercial models", that really spurred their business careers. To sell the product, they needed a company - and Microsoft, without the hyphen, was born.

76 GATES SENDS 'THE OPEN LETTER TO HOBBYISTS'

Altair BASIC did well, but not well enough for the budding entrepreneurs. At a seminar for the legendary Homebrew Computer Club, a paper tape with the code for Altair BASIC on it disappeared - and at the next meeting, 50 copies of the tape were freely handed out.

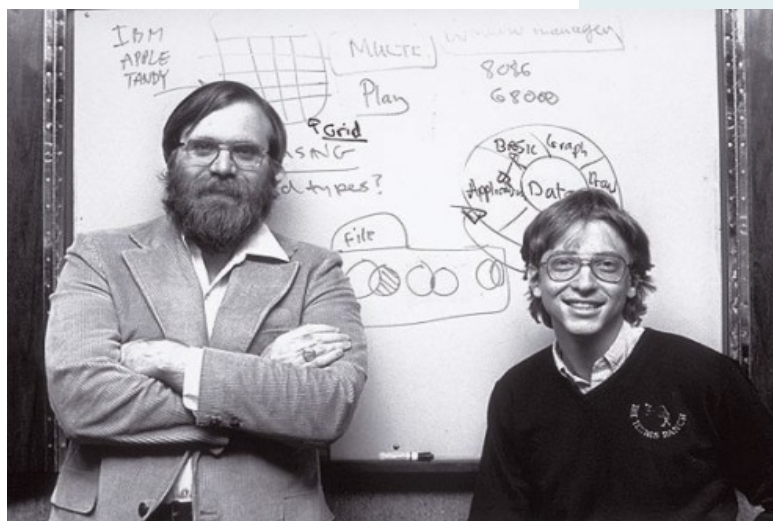
This was entirely in accordance with the culture of computing at the time. Code was something you shared, not sold - but Microsoft was receiving a royalty on every copy of BASIC shipped by MITS. And, although MITS was selling hundreds of Altairs per month, only a few tens of copies of BASIC were going

along with them.

Appalled by what he saw as the theft of Microsoft code, Gates wrote an open letter to the hobbyist community, which appeared in the Homebrew Computer Club newsletter. He pointed out that "most directly, the thing you do is theft" - setting the tone for the battle between commercial software and piracy that goes on today.



✓ Paul Allen and Bill Gates in the early days of "Micro-Soft" and the Altair 8800



1977 GATES GETS ARRESTED, AND THE INFAMOUS "MUGSHOT" IS BORN

If Gates was determined to ensure that computer hobbyists obeyed the law, he was less interested in obeying it himself. Twice, in 1975 and 1977, he was arrested for speeding, although

some reports embellish this by adding in driving without a licence and running a stop sign.

The second arrest generated one of the most famous images of Gates. Sporting a floral shirt, curious "casual" sweater and a pair of glasses that could only come from the 1970s, the 21-year-old Gates' mugshot makes him look like a teenager, complete with a boyish grin that suggests he really doesn't care about the arrest.

However, the mugshot has had a bigger influence than you might think. Ken Fisher, editor-in-chief of Ars Technica, noticed that the default image silhouette used in Outlook 2010 bore a remarkable resemblance to the mugshot. We have no way of verifying this, but the similarities are certainly there to see.

1977 GATES OFFICIALLY LEAVES HARVARD

Harvard's student newspaper, The Harvard Crimson, once named Bill Gates the university's "most successful dropout", and it's hard to disagree. Gates' record at Harvard was, to say the least, patchy: initially enrolling in 1973, he attended for a few semesters here and there before formally dropping out in 1977, just two semesters short of graduating. He got an honorary degree from the

university in 2007, when he told the audience for his speech that "I've been waiting more than 30 years to say this: Dad, I always told you I'd come back and get my degree."

However, Harvard had one important impact on Gates' life: it was where he first met Steve Ballmer, who was to join Microsoft in 1980 and rise to being both Gates' best friend and CEO.

1981 GATES, KILDALL AND MS-DOS

One of the biggest characteristics of Gates' career is his ability to make the most of even the tiniest opportunity, and nothing illustrates this like the deal he made with "Big Blue" to use MS-DOS on the new IBM PC.

The opportunity came when Gary Kildall, founder of Digital Research which owned the then-dominant CP/M operating system, failed to make a deal quickly enough with IBM (the oft-repeated story that Kildall was out flying his personal plane when IBM came calling and refused to land is, sadly, untrue).

Instead, the deal came about when Jack Sams, the lead

1983 GATES STEALS THE TV FROM "THEIR RICH NEIGHBOUR XEROX"

Microsoft started to compete with "Apple Computer" in the early 1980s. Prior to the release of the IBM PC, Apple was one of the largest and most important PC makers in the world, but, by 1983, it had a strange relationship with Microsoft. It wanted to keep Microsoft onside, to get it to develop applications for the upcoming Macintosh, but was also worried that Microsoft would copy the graphical user interface (GUI) for its PC-DOS.

However, Microsoft did the inevitable and announced the first version of Windows. Steve Jobs was furious, saying "get Gates down here immediately!" Gates calmly replied: "I think it's more like we both had this rich neighbour named Xerox and I broke into his house to steal the TV set and found out that you had already stolen it." Apple had (legally) "borrowed" the GUI concepts from Xerox. In the end, the Windows GUI wasn't very Mac-like, but that didn't stop Apple suing.

1997 GATES LENDS APPLE \$150 MILLION

If relations between Apple and Microsoft had started declining in the 1980s, by the mid-90s they were in need of counselling. When Steve Jobs became interim CEO following the departure of Gil Amelio, the company was close to bankruptcy. It needed two things: money, and confidence that Apple had a future.

Jobs called his old sparring partner Gates, and put a potential deal to him: Microsoft would invest in Apple, receiving non-voting stock. In return, the two companies would settle some long-running legal disputes.

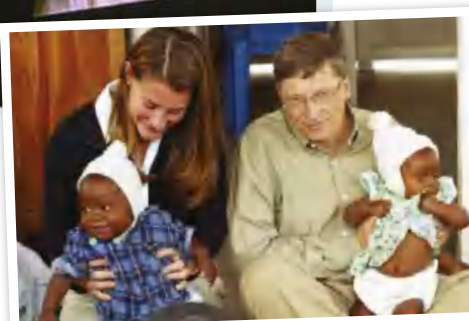


▲ Bill Gates made the most of an opportunity with MS-DOS



▲ The DOJ deposition shows Gates at his worst

▼ Bill Gates appears via video link on a giant screen at 1997's Macworld Expo in Boston and, bottom, with his wife in a publicity shot for the Bill & Melinda Gates Foundation



Gates accepted.

What followed was remarkable. At the summer's Macworld Expo in Boston, Gates appeared on a giant screen to announce the deal. It was a metaphor for where the two companies now found themselves: Microsoft, the giant of the industry; Apple begging scraps. The crowd booed - Jobs told them to "forget the idea that for Apple to win, Microsoft has to lose".

1998 GATES APPEARS BEFORE THE ANTITRUST TRIAL

The Microsoft antitrust cases brought by the US Department of Justice and the European Commission have probably done more to shape the recent history of the company than anything else. Had Microsoft not had its wings clipped by the DoJ, it could have brought more of its muscle to bear on the mobile market, and made it harder for Android and iOS to gain a foothold.

A turning point in the DoJ case was Gates' appearance before the court to give his deposition. Rather than appearing in person, he gave his testimony via a video link from a Microsoft boardroom. Reports at the time described his testimony as "evasive and unresponsive", with Gates doing his best to pick holes in questions and effectively refuse to answer them.

2000 GATES APPOINTS BALLMER HIS SUCCESSOR

Steve Ballmer had been at Microsoft for 20 years by the time Bill Gates decided to stand down as CEO of the company. He had long been seen as the "prince in waiting", the obvious successor to Gates. It was only really a question of when Gates thought the time was right to step aside.

That moment came in 2000, and it's fair to say that it proved to be one of the less successful decisions in Gates' career. The early years of Ballmer's leadership saw Microsoft at its peak and making more money than it knew what to do with, but it lacked the ability to anticipate the products that would supersede Windows, continuing to bank just on Office and Windows.

2000 THE BILL & MELINDA GATES FOUNDATION LAUNCHED

The biggest surprise in his career is probably endowing most of his money to a charitable foundation. That he also created the foundation with the aim of improving global healthcare, reducing poverty and expanding educational opportunities might have been even more of a shock.

It's a cliché to suggest that Gates' marriage to Melinda French in 1994 brought about a change in his personality. In fact, what probably changed him more was having three children. Coupled to Gates' ferocious intelligence and curiosity about the wider world, it's easy to see how a wider challenge of changing the world might be something he wanted to do.

The Gates Foundation has the largest endowment in the world, with over \$42 billion in funds, and has already seen results. With the help of a vaccination drive, deaths from measles in Africa have fallen by 90%, and the foundation spends more money trying to cure the diseases affecting the world's poorest people than any other organisation. Gates has saved countless lives, and for that we can even forgive him for Windows ME. ●



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IN THE LABS

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Unexpected excitement

BEN MANSILL FINDS THAT INNOVATION ISN'T LIMITED TO THE BIG THINGS

It's always nice to see relatively big leaps forward in areas usually a little dull. Like printers. Like you, probably, we respect these machines, but rarely does anything get us truly excited. No offense, printer company people, but I think you know that 'solid workhorse' is as big a compliment that any printer will ever get.

So when Bennett started raving about Epson's new ink tech that delivers an astounding 11,000 pages from a single tank of ink, we stopped what we were doing and listened up. Check out the review of the Epson ET-4550 on page on page 35, if we can excite you about a printer, then we have done our job well.

LITTLE BIG BOARDS

Motherboards are a bit more exciting, being at the heart of our desktops. Especially so when a new chipset and accompanying CPU are thrown into the mix. In PC&TA 215 we called in the big guns, putting the new high-end Z170 chipset boards for 6th-gen (Skylake)

through the labs. Now it's time to look at budget boards, and as we found out there is some seriously impressive kit available for under \$200. This is all great news for anyone contemplating a new build, but may have been put off by the pricier boards we've looked at. Also very interesting is that microATX boards feature so strongly. This is the form factor on the move, and it's about to get a whole lot of impetus when SteamOS picks up... steam (sorry!). Suddenly small living room/media room PCs will be super desirable, and at the heart of most will be microATX boards. Watch this space!

SMARTER PHONES

Smartphones are now almost universally capable. Gone are the days when one held sway over another in key areas, like battery life, CPU performance and storage. Well, mostly. We're seeing a trend towards style over substance, which may be great news if your surname is Kardashian, but in the real world too many

compromises are creeping in. Samsung ditching microSD expansion and water resistance in the Galaxy S5 in favour of a slim and pretty handset, but with neither of those things in the Galaxy S6 is a case in point.

Apple is another sinner, with that. I've been using an iPhone 6S for a couple of weeks and it's very hard to love. The battery life is well short of what's expected in 2015, and when paired with an Apple Watch it barely makes it through the day. That's just not acceptable today, especially when a Galaxy S6 can go two days, often more if I'm just making occasional calls. So I've switched again, now to the new Sony Xperia Z5 Compact and it's easily the nicest smartphone I've ever used. The brickish shape is perfect to hold, the fingerprint scanner works instantly, every single time, and it's positioned perfectly half way up the side, it's water resistant and the battery goes for two to three days easily. That's how it's done everyone else. Full review next issue.



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WHAT OUR A-LIST MEANS

Our A-List award is reserved for the best products in each category we review. With a winner and an alternative pick in each, that's 92 products you know are first class.

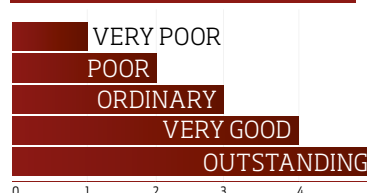


WHAT OUR AWARDS MEAN

PC & Tech Authority's comprehensive Real World testing sorts out the best products from the pack. Any product recommended by PC & Tech Authority is well above average for features, value for money and performance.



WHAT OUR RATINGS MEAN



HOW WE TEST

Our benchmarking tests are the best in the business. Read on to find how they work...

2D TESTS

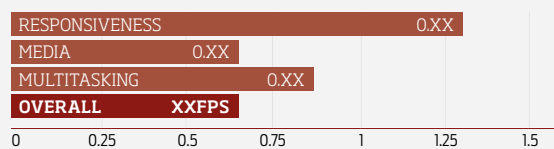
We test desktop PCs, netbooks and laptops with our own, custom-built, 2011 Real World Benchmarks.

We split the results into three categories: Responsiveness, Media and Multitasking, with the Overall score an average of the three sub-scores.

For instance, responsiveness replicates light browser and productivity workloads. The Media test involves running iTunes for audio conversion, Photoshop CS5 to crunch large images and Sony Vegas 10 to edit home video. This then gets run simultaneously alongside Cinebench 11 in order to get a handle on the multitasking ability of the system.

BENCHMARKS

3.4GHz Intel Core i7-2600K, 4GB DDR3 = 1



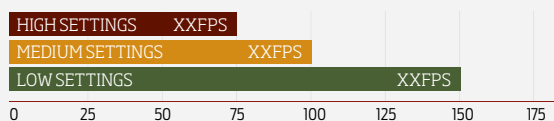
3D TESTS

We use pre-recorded demos in Crysis and DIRT 3 to test gaming performance where relevant. We have three standard test settings, depending on the power of the graphics card: Low, Medium and High.

To test gaming performance, we use our own recorded Crysis benchmark. We use the Low, Medium and High quality settings in 1366 x 768, 1600 x 900 and 1920 x 1080 screen modes respectively. Very high-end systems can also be tested using the ultra-intensive Very High settings, with all detail switched on, and varying levels of anti-aliasing enabled.

3D SPEED

■ GOOD ■ PLAYABLE ■ UNPLAYABLE



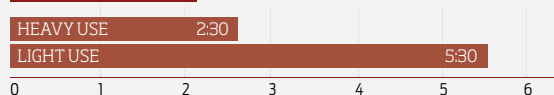
LAPTOP BATTERY LIFE

We subject laptops to two battery tests. In the light-use test, we optimise the system settings for the greatest power efficiency. We then disconnect the mains and run a script scrolling a selection of web pages until the system shuts down, giving you a realistic idea of the surfing time each laptop offers.

For the heavy-use test, we engage Windows' High Performance power profile, set the display brightness to maximum, and allow the taxing Cinebench 3D renderer to push the processor load to the limit. This gives a worst-case figure, revealing how long you can expect the battery to last under the most demanding conditions.

BATTERY LIFE

HOURS:MINUTES



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Microsoft Office 2016 for Windows

OFFICE REMAINS THE STRONGEST PROFESSIONAL OFFICE SUITE AROUND, BUT SHOULD YOU UPGRADE? THAT'S A DIFFERENT QUESTION

Some of my earliest memories of using a proper computer involve Microsoft Office. Since those heady days in the early 1990s, I've spent probably more time using Office apps than I have anything else.

I'm not the only one who has spent more time than is healthy using Microsoft Office, though – it has been used by businesses across the world as the primary tool for productivity for nigh-on 20 years. That's why, with the launch of Office 2016, the news that not an awful lot has changed shouldn't come as a huge surprise.

The biggest change you'll see in Office 2016 is a fresh lick of paint, with all the various apps gaining toolbars coloured in their signature livery. Most of the apps have been made more searchable via the new "Tell Me" feature, but apart from a few small additions, that's it. There has been no dramatic Windows 10-style overhaul, not even any eye-catching Cortana integration.

THE FUTURE

This is because Office doesn't need an awful lot of work. Aside from Outlook, all the apps deliver more features than most users know what to do with, and they do their job well. Many workers rely on specific features of Word, Excel and PowerPoint to carry out their jobs, and there's nothing else on the market that can rival its apps for power and breadth of features.

Another reason is that the device landscape is shifting dramatically, and Microsoft is rightly focussing more of

its attention on getting its mobile apps working well on tablets and other mobile platforms. The advent of the Apple iPad Pro is a signal that Microsoft can't rely on the traditional PC platform to deliver a steady stream of users forever.

Perhaps the biggest change, however, is the shift away from one-off perpetual licences for major, business-critical software like Office to subscription-based solutions. With Microsoft now firmly focussed on its Office 365 subscribers, who receive the Office 2016 update for "free" (along with all other future updates), it's perhaps understandable that the firm is less interested in delivering a big splash of features every three years or so, and more in delivering further improvements.

That's fine for those who have already bought into the Office 365 way, and there are plenty of reasons for taking on a subscription, not least the ability to install Office on multiple machines for \$12 per month.

However, for anyone who doesn't need that, this brave new world isn't good news. There's no getting away from the fact that Microsoft Office 2016 for Windows is a damp squib from a new features point of view, and I wouldn't recommend you upgrade to Office 2016 as a standalone product from Office 2013.

There simply isn't enough new here to justify a spend of \$179 (for the Home and Student edition). You're better off waiting for the next release or biting the bullet and jumping on the subscription bandwagon.

WORD 2016

Word is one of the applications to get the all-new "Tell Me" lightbulb above the ribbon, and it works well as a quick way of finding features without having to hunt through the various ribbon tabs. You can do a word count, for example, by typing Alt+Q to focus on Tell Me, then typing

< Changes show up for all authors in the impressive new co-authoring feature

✓ The Tell Me lightbulb found above the ribbon is an easy alternative to hunting through tabs

"There's no getting away from the fact that Microsoft Office 2016 is a damp squib from a new features point of view"

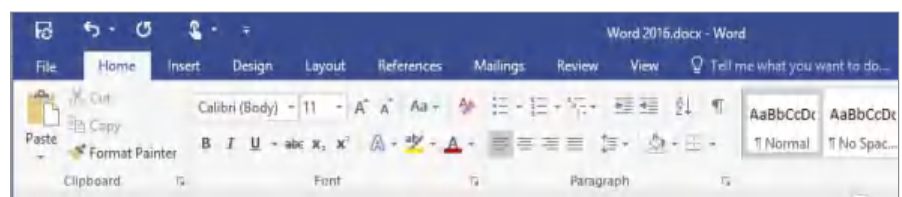
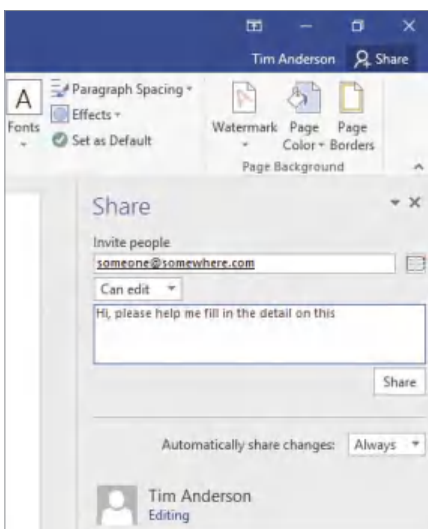
"word count" and pressing Enter. Even better, next time you type Alt+Q, your previous selection pops up by default, further speeding up your work.

The big new feature is real-time co-authoring, which works in conjunction with Office 365 or OneDrive. Once you have saved a document to one of these locations, you can click the Share button at the top right and select or type an email address. The recipient gets a link to the document, and, provided they use either Word 2016 or Office Web Apps, they can edit the document, with changes showing up for all co-authors as they type. In practice, there is a short delay, but this feature is technically impressive.

Word has had collaboration built in before, but this version is more dynamic, with changes appearing as they're typed rather than when they're saved. The one catch is that you have to use Microsoft's cloud – an on-premises SharePoint server is not enough, and it isn't bug-free. I saw glitches appear as I was testing the software, such as a document that should have been shareable raising the mysterious error: "Sorry, something is preventing us from sharing this."

Another Word enhancement is called Smart Lookup. This is a right-click option for highlighted text, and replaces "Search with Bing" in Word 2013. Type "Ada Lovelace", for example, perform a Smart Lookup, and an Insights panel will open with a picture and biographical information. In the end it's just a web search, and searching in a web browser gives richer results, but having information in a panel within Word makes it easier to use the information while you type.

Equation editors can be fiddly to use, so



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mathematical tablet users may like the new “Ink to Math” converter, which opens an input panel where you can handwrite an equation. This attempts to read your writing, and then inserts it into your document. I had some difficulty getting the editor to recognise my sigmas and round brackets, but it recognised most of my other symbols without a problem.

You may correctly conclude that Word 2016 lacks new features, particularly if real-time co-authoring isn't something you need. In reality, the upgrade is a hard sell to customers with existing perpetual licences.

EXCEL 2016

Microsoft's spreadsheet and data-analysis tool is the jewel in its Office crown. It's a behemoth, an app so widely used, and so far in front of its competition, that it doesn't need a big boost to its capabilities – fine-tuning is all that's really required.

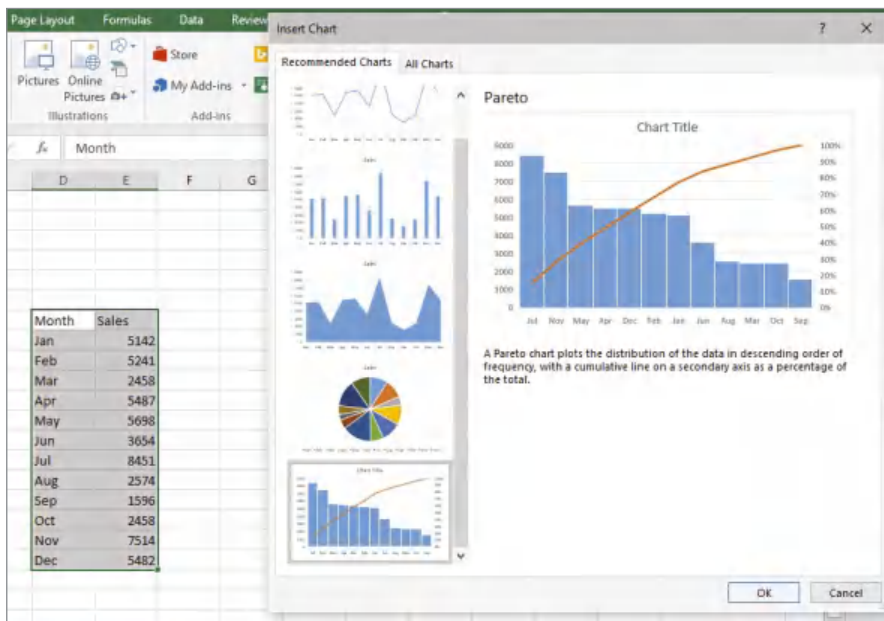
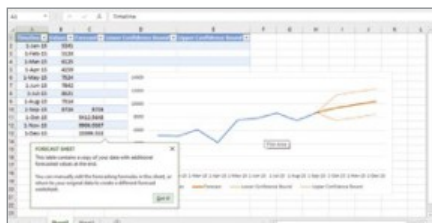
And that's what it gets in the 2016 release. It misses out on the real-time collaboration features found in Word, PowerPoint and OneNote, but gains a new appearance, which is nice but not necessary, plus a scattering of welcome enhancements.

The new features start with six new chart types:

- Treemap, showing hierarchical data as nested rectangles
- Sunburst, showing hierarchical data as concentric rings
- Waterfall, using floating columns to show changes between full columns
- Histogram, a statistical chart showing data distribution
- Pareto, combining columns with lines to show both individual and cumulative values
- Box and Whisker, showing a range of values with the average values in a box, while lines are drawn at either end to show maximum and minimum values.

The beauty of Excel's charts is the ease with which they can be created and modified, and the new charts are very welcome. There's a new Forecast Sheet wizard that automates building a sheet that forecasts data based on an existing series. It's supported by an enhanced

- ✓ The Forecast Sheet wizard creates a new sheet that forecasts data based on a series



- △ The new Pareto chart type combines columns with lines to show different values
- The 3D maps, once known as Power Maps, is now part of the main product

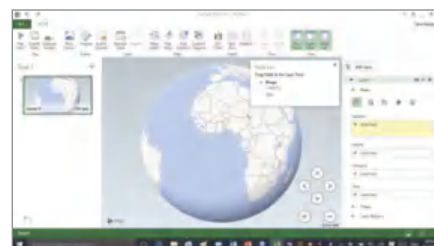
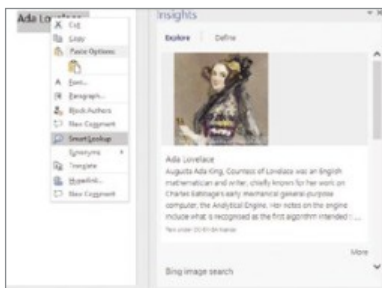
Forecast function.

Excel's powerful PivotTables tool is also improved in this release. A pivot table lets you analyse data by having Excel perform sums, counts and averages according to the columns you select, and cross-tabulate one set of data with another. Excel 2016 adds features including automatic relationship detection and time grouping, drill-down buttons that let you zoom in and out of data, and delayed updating so you can make changes before Excel calculates the results.

The Power Query add-in, used for connecting to data from a variety of sources, is now built into Excel, integrated into the Data ribbon. And 3D maps, an add-in previously known as Power Maps, is also now part of the main product, provided you activate the Data Analysis add-in.

There are smaller improvements, too. When you insert a photo into Excel it picks up on the orientation

- ✓ Smart Lookup opens an Insights panel with the search results

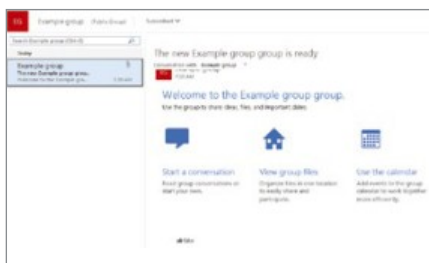
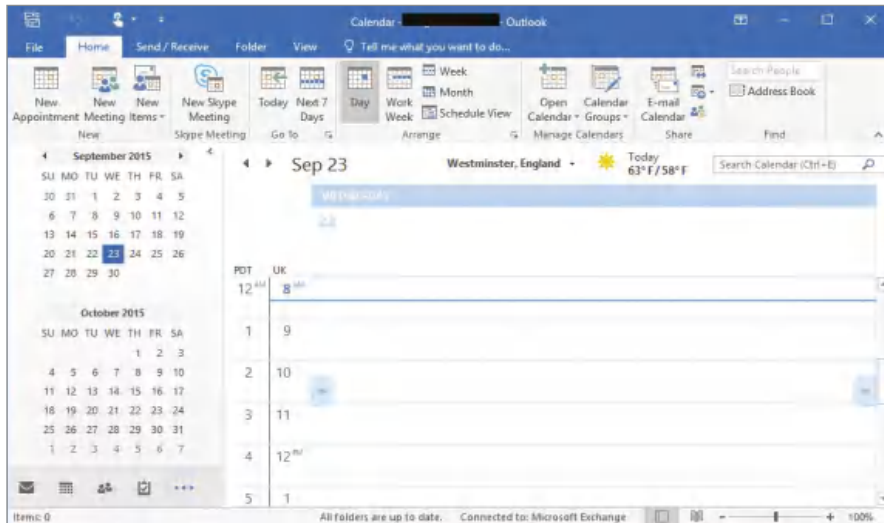


information held in the EXIF data – and rotates the photo accordingly. You also get the Tell Me feature, as found in Word, Outlook and PowerPoint. Hit Alt+Q (the quickest way to access the feature) and you can search for tools and functions by keyword.

This doesn't work quite as well as you might expect it to. For example, typing “set a heading row” into the new wizard yields nothing helpful, but typing “freeze panes” brings up the option to freeze the top row. Furthermore, it only searches the menu and ribbon bar tools, not Excel's functions.

If you use Office 365 or SharePoint, you can now access document history from within Excel. The File History panel shows previous versions, and by selecting a version you can preview and restore it. Excel also benefits from the Ink to Math equation editor, as found in Word.

Just as with Word, there's nothing significant about the upgrades to Excel in this release, but most of them are usable whether you buy a perpetual licence or plump for Office 365, and everything is nicely implemented. Excel is the Office application that its competitors find hardest to match. It combines deep features with usability and a clean user interface more successfully than



the other Office applications, provides businesses with tools that have become indispensable for many, and it remains the spreadsheet application to beat.

OUTLOOK 2016

Outlook does a great job of integrating email, contacts, calendar and tasks, but has long suffered from an overly complex user interface and has plenty of long-standing annoyances. It uses embedded Word as the email editor, for example, and a side-effect is the poor rendering of HTML emails and difficult formatting if you want to intersperse your reply with quotes from the message you've received.

Little has changed in the Office 2016 release, but there are a few new features. The most interesting concerns the sending and sharing of attachments. When you attach a document stored in OneDrive to an email, for instance, Outlook sends a link to that document by default, rather than attaching the file. Unless you adjust the permissions, documents sent in this way also give editing permissions to the recipient. This is great for collaboration, but only provided users understand what is happening. However, if you don't want to do it the new way, you can send cloud documents with view-only links, or as traditional attachments – and if you select a document stored on your PC, it's attached in the normal way.

There are also a couple of new features

- ▲ The new Groups feature includes a shared calendar
- ◀ A Group is effectively an enhanced mailing list for your colleagues

that are really part of Office 365, but which are now also in Outlook. One is the Clutter folder, intended for messages that are low priority, as distinct from junk mail. Clutter depends on learning algorithms implemented in Office 365, but it also shows up in Outlook now; this means, if you come across a message you think the algorithm has missed, you can choose "Move to Clutter" from a right-click message menu. This not only moves the message across to the Clutter bucket, but also helps to improve the accuracy of the service. You still need to visit the Office 365 site to turn Clutter on or off, however.

The other new Office 365 feature is Groups, for which you need an Enterprise subscription. A Group is effectively an enhanced mailing list, and one restricted to members of your organisation. You can send emails to the group, but you also get a shared calendar and a document storage area for basic collaboration. Old-style contact groups are still available too.

If you don't use Office 365, there isn't much new other than the fresh look, which applies throughout the suite, and the Tell Me feature for searching for commands or help. Since Outlook has many buried options, Tell Me has potential. One example is if you're writing an email and want to add someone to the bcc (blind copy) list, or change the From address. Outlook hides these options by default, and you need to click the Options tab and show the fields before you can use them. Now, you can click Tell Me, type "bcc", hit Enter, and the option appears.

It's disappointing that so little has been done to improve a core part of Office 2016. With former Acompli CEO Javier Soltero having taken over as corporate VP for

Outlook – Acompli being responsible for the mobile versions of Outlook – I hope he can bring usability improvements to the desktop product over time.

ONENOTE 2016

The Office 2016 version of OneNote is essentially the same as OneNote 2013, although with the more colourful look and feel as in the rest of the suite. Bizarrely, however, it doesn't include the Tell Me feature prevalent across the rest of the applications.

Despite the lack of new features in this particular release, there are plenty of things that have happened to OneNote since Office 2013. One handy feature is the ability to send notes by email. The idea here is that you may find something you want to capture in OneNote when the application itself isn't to hand. If you send an email to [yourname]@onenote.com, the content is sent to a new page in a OneNote notebook stored on OneDrive. You need to set this up by registering the email address on onenote.com, where you can also specify the recipient notebook.

Other ways to send content to OneNote include Clipper, a browser link that can capture web pages, and Office Lens, which is a mobile scanning app for iOS, Android and Windows Phone that can send images taken by your phone's camera.

Still, OneNote remains Office 2016's unsung hero, and changes introduced over the years add up to a decent note-taking system.

One of my favourite features is the audio-recording system, which remains in place here. Start taking notes, hit the record button and the two are cleverly linked together as you type. This means you can select a written note and play the recording, or play the recording and see the related written notes highlighted during playback. Irritatingly, its one fault – terribly low recording quality default settings, which in a new install of OneNote 2016 are 12Kbits/sec, 16kHz mono – hasn't been rectified in OneNote 2016.

And Collaboration in OneNote is crying out for the kind of real-time co-authoring enjoyed by Word and PowerPoint in this release (and by users of Google Drive the

- ✓ Content can be sent from OneNote to a notebook page on OneDrive



world over). You can still work on shared notes, but other users' changes won't appear as they type them, meaning you have to wait until they sync, which can take some time.

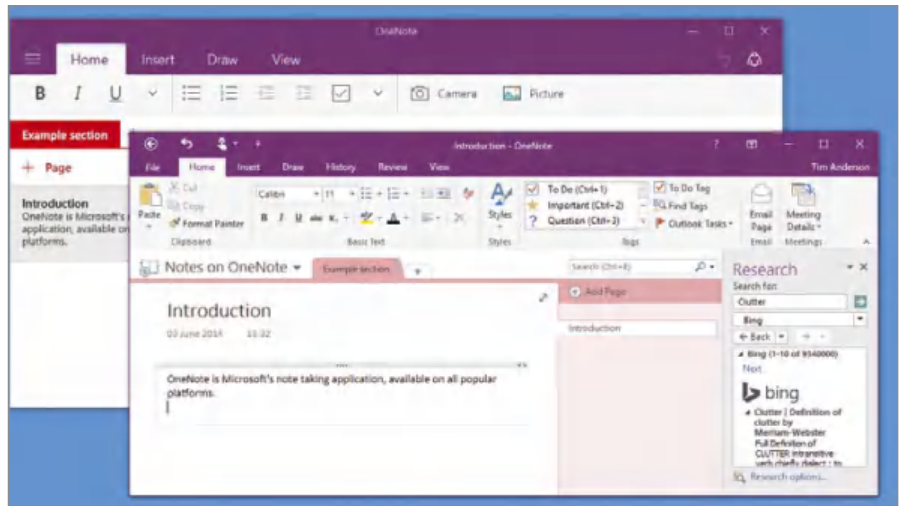
However, despite the lack of new features, OneNote remains a powerful and flexible note-taking system, and is now well supported across all popular platforms, including the web. The next job, and perhaps one Microsoft ought to have undertaken in Office 2016, is to push users into using it more often than Word, and making more use of its useful toolkit.

POWERPOINT 2016

Microsoft's ubiquitous presentation graphics application gets the full Office 2016 treatment in this release, including Tell Me command search and help, a more colourful appearance by default, Smart Lookup for Bing search results in a panel, and simultaneous co-authoring.

Note, though, the latter only works if you've saved a presentation to OneDrive or Office 365. As long as that's been done, you can click the Share button in the top right of the application window and send an invitation to others to edit.

However, the process is far from seamless. Once your contact gets the link to the document, the document is opened in Office Web Apps, and if you want to edit the presentation in the desktop app, you have to click yet another option to finally open it in PowerPoint. This isn't the end of the irritations, either, with security warnings first from the browser, and then



from PowerPoint, stating "be careful – files from the Internet can contain viruses", getting in the way.

At this point, all contributors can work simultaneously. It still isn't perfect since you don't see changes until the document is saved.

Although the process worked when multiple contributors were working on separate slides, it slipped up when we tried amending a bullet point simultaneously. PowerPoint messed up the merge, silently moving some text from one bullet to the next. Users will need to check for issues such as this.

One useful addition is that PowerPoint 2016 benefits from the new chart types introduced with Excel, namely Treemap, Sunburst, Histogram, Box and Whisker and Waterfall. When you edit chart data, an embedded Excel sheet appears – a good example of Office 2016's components working together as they should. Tablet and stylus users can use

< You can export a presentation as a video and then upload it to YouTube

✓ PowerPoint 2016 also benefits from the new charts introduced in Excel

△ Despite the lack of new features, OneNote remains a powerful tool

the Ink to Math equation editor, as found in Word and other Office 2016 applications.

That's it for new features, though, making this yet another application that has received only light changes.

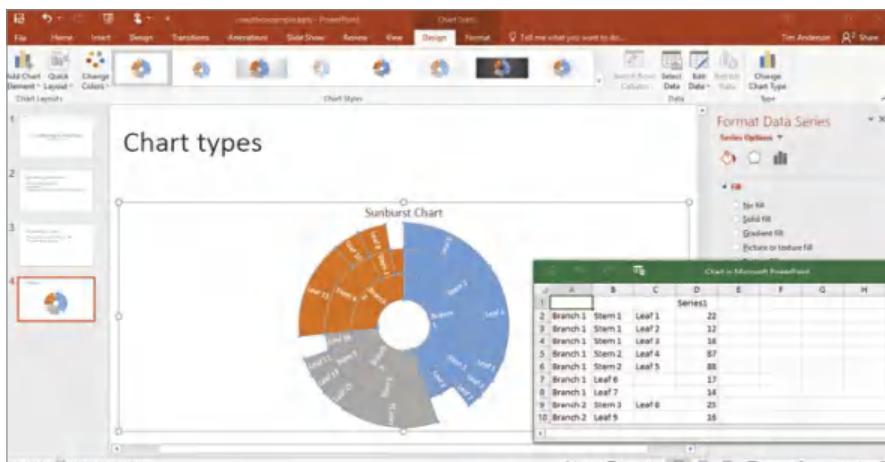
No doubt the PowerPoint team has been distracted by the work carried out on the companion applications in Office Mobile, and in the Mac edition, which was released earlier this year with many improvements.

That said, it's worth noting that, since PowerPoint 2013 was introduced, the Office development team hasn't been idle. Other features, such as screen recording, which lets you make a video by capturing all or part of the screen together with an audio commentary, have been added in recent updates.

On the subject of videos, it's worth noting that you can export a PowerPoint presentation as a video, recording your narration and even inking and screen pointing, which can then be uploaded to Office 365 or YouTube. This makes PowerPoint, together with a microphone, a handy all-in-one tool for creating and publishing lectures and tutorials.

PowerPoint has always been a flexible tool for presenters and educators alike. That hasn't changed in this release, despite the relative paucity of new features, meaning PowerPoint remains a capable and mature product.

Tim Anderson, Jonathan Bray



KEY SPECS

\$179; Home and Student standalone; from \$9/mth as part of Office 365
www.microsoftstore.com

OVERALL



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Tt eSPORTS
By Thermaltake



MSI GS40 6QE Phantom

MSI STITCHES UP VALUE MOBILE GAMING

When it comes to gaming laptops, one company in particular seems to have the market stitched up. MSI has easily the widest range of gaming laptops in Australia, which is probably also why they tend to offer the best value. The new GS40 is a 14 incher that balances mobility with performance, and comes with the latest hardware from both Intel and NVIDIA.

Weighing in at 1.6kg, the GS40 isn't going to require a visit to the chiropractor if it's taken out and about for a day or two. Part of the reason it's relatively light are the diminutive dimensions, dictated by the small-ish 14 inch display. Despite the screen's small size, it's still a full HD panel packing 1920 x 1080 pixels, and it's of the favoured IPS variety. We found the image quality to be outstanding, with especially rich and vibrant colours, and viewing angles are nice and wide thanks to the IPS panel.

The chassis is made from plastic, helping to keep the weight and price down, but not exactly inspiring confidence when it comes to ruggedness. That's the price of affordability though. The backlit keyboard uses the usual island key design, and there's just a little bit of flex in the middle when pressed forcefully. Overall though it feels like it's

fine to take out and about.

One nice feature found on the exterior of the chassis is the inclusion of a couple of USB 3.0 Type-A ports, along with a single Type-C USB 3.0 port. The latter is a welcome addition, as the more devices to use this, the more likely we'll see this excellent symmetrical plug design take over from the asymmetrical Type-A controller. On the flipside, we're not so enthusiastic about the use of Killer's networking hardware, given its proclivity to add game-killing lag if it chooses not to play well with your favourite game.

Heading under the hood reveals cracking hardware for this price point. Intel's brand new 6th Generation Core i7-6700HQ CPU is a potent quad-cored, Hyper-Threaded beast, with a top speed of 3.5GHz. It's tied to 8GB of DDR3, which is a little on the light side but to be expected at this price point. What we didn't expect was the generous hard drive solution. Along with a huge 1TB mechanical drive, MSI has wisely included a small 128GB SSD for the Operating System and favourite applications. It's no mere SATA 3 SSD though, instead utilising the new NVMe interface over a PCIe 3.0 bus. No wonder it whipped through our productivity benchmark, PCMark's Home Accelerated test, like a chainsaw through whipped cream. This is one of the best laptop results we've seen, very impressive considering the price point.

MSI has positioned this as a gaming laptop, and it's all thanks to the Nvidia GeForce GTX 970M GPU included within.

This has its own 3GB of GDDR5 memory, and is roughly equivalent to a desktop GTX 960. As such, don't expect to crank The Witcher 3 to Ultra detail at 1080p, but it'll handle most modern games with a mixture of high and medium settings. As our game benchmarks show, it easily bested the less demanding Grid Autosport at Ultra detail, while Shadow of Mordor proved that cutting-edge graphics are a tad optimistic for this machine.

While it's no competition for laptops like the twin-GPU speed machines from Aorus, the use of a single GTX 970M brings one important benefit to the GS40 – this machine remained whisper quiet throughout our benchmarks, which is testimony to Nvidia's low-heat emitting design.

MSI once again delivers an outstanding machine for the price, with an excellent mix of interior components combined with a classy display. The plastic build quality does feel a little cheap, but we can't really complain when it's possible to buy a truly game-ready laptop for less than two and a half grand.

Bennett Ring

KEY SPECS

\$2399 • www.msi.com

14" IPS 1920 x 1080 panel • Intel 6th Gen Core i7-6700HQ CPU (quad-cores, 3.5GHz) • 8GB DDR3 • 128GB NVMe SSD • 1TB HDD

OVERALL



WD My Book Pro External Thunderbolt & USB 3.0 Hard Drive

TWO BIG SPINNING DISKS IN A THUNDERBOLT & USB 3.0 ENCLOSURE BRINGS FAST, HIGH CAPACITY STORAGE WITH RAID SUPPORT

SSDs are all the rage, but sometimes you just need heaps of storage and to do that with SSDs will cost a fortune. This is where the WD My Book Pro excels. Two WD Black 7200RPM hard drives are inside a well built enclosure, featuring USB 3.0 and Thunderbolt connections. The enclosure also supports RAID, either in a RAID-1 mirror for data redundancy, or a RAID-0 stripe, for speed. JBOD is also an option if you'd like two separate disks.

The front of the enclosure has two USB 3.0 ports, which act a traditional USB hub, even if connected via Thunderbolt. Each disk is replaceable, with easy to open bays. You could even use non-WD disks if you like, or upgrade to larger

disks later.

Out of the box the drive is formatted as HFS+ for use on a Mac – a simple reformat is required for operation on Windows. Configuring the RAID status of the enclosure is done via the WD Drive Utilities tool, which is available on the drive itself when mounted on Mac, or available via the WD website if you

had to reformat it for use on Windows. Also available in the WD Drive Utility is the option to set a sleep timer for the drives and a health check feature to determine if the drives are susceptible to failure before they actually die and take your data with it.

A quick test using Blackmagic Disk Speed



Test on a 2014 MacBook Pro, benchmarks sequential read and write speeds hovering around 400MB/sec over Thunderbolt and 350MB/sec on USB 3.0. Considering the speed of the drives, they're relatively quiet when idle and silent when sleeping. Writing a full speed however, gets a bit noisy with both drives crunching away.

The inclusion of WD's excellent performing Black HDDs makes the WD MyBook Pro an awesome choice for those needing a large amount of fast storage.

Anthony Agius

KEY SPECS

\$999 (6TB); \$1299 (8TB); \$1699 (12TB)

• www.wdc.com.au

Dual disk external hard drive • 6TB, 8TB, 10TB and 12TB capacities • Thunderbolt & USB 3.0 interface • JBOD

OVERALL



WD My Cloud Mirror (Gen 2) NAS

AN UPDATE TO WD'S FIRST MY CLOUD NAS RANGE THAT KEEPS THE PERSONAL CLOUD FOCUS.

WD are a huge manufacturer of hard drives, so to see them in the NAS arena isn't a big surprise. However, they're up against stiff competition from Synology, QNAP and even Asustor. The unit we are looking at today is the second generation My Cloud Mirror, which runs My Cloud OS 3 and packs a faster dual-core Marvel Armada ARM based CPU.

The unit itself is compact, relatively quiet and has a spiffy glossy white exterior. It has a single gigabit Ethernet connection and two USB 3.0 ports. The drives inside are user replaceable, just pop the lid off the top of the My Cloud and slide the drives out.

Ease of use is the My

Cloud's main selling point and setting up the unit is simple. It arrives pre-configured so plug it in to power, plug in an Ethernet cable and off you go. Visit <http://wdmycloudmirror.local> in your browser and you can log in and start playing around to configure the unit to your liking.

My Cloud OS is one of the more stripped back and easy to use NAS operating systems on the market. Creating new users and network shares is a piece of cake. Making the data stored on your My Cloud, such as photos, videos and music, available to the outside world on your smartphones is easy. No port forwarding or domain names or anything like that

required as it's all set up via WD's My Cloud website.

There's a new API facility in My Cloud OS 3 that 3rd party developers can tap into, something sorely lacking from the previous version of My Cloud OS. There's now popular apps such as Transmission, Dropbox and Plex Media Server currently available and more coming soon.

The WD My Cloud is easy to use but nowhere near as versatile as the alternatives from Synology or QNAP, making it difficult to recommend unless your needs are basic and you find it on sale somewhere.

Anthony Agius

KEY SPECS

\$499 (4TB) • www.wdc.com.au

Dual bay • gigabit Ethernet • 8TB, 6TB, 4TB capacities

• iOS and Android apps available

OVERALL



HP Envy 15 Laptop

THE TERM 'SOLID WORKHORSE' COMES TO MIND

The HP Envy 15 certainly looks decent. The brushed metal-like finish looks and feels modern and expensive. It's not to Apple's standard, but it's not too bad. This Envy is also a heavy laptop. It's definitely in the desktop replacement weight division, tipping the scales at a shade under 2.4kg. A road warrior this laptop is not.

Open up the laptop and the lid – which curves around the spine – also props the keyboard up at a slight angle, and two rubber grommets ensure the paintwork doesn't rub against the table. It's a nice little design touch, and it elevates the base of the laptop, improving the airflow underneath for cooling purposes.

HP has elected to use backlit chiclet-style keys on the keyboard, and colour them silver. Being the 15in model, there is also a full numeric keypad, and a large, multitouch trackpad. On the left are the headphone/mic combo jack, three USB 3.0 ports, an HDMI port and an RJ45 port. Why manufacturers bother with an Ethernet port if they don't make it Gigabit

is beyond me. Surely a laptop costing a couple of thousand dollars is worthy. On the right is another USB 3.0 port and a multifunction SD card reader.

The guts of the laptop consist of an Intel Core i7-5500 CPU, 8GB of DDR3 RAM, and a 2TB SATA HDD. It also has an 802.11a/b/g/ac wifi card, and an Nvidia GeForce GTX950M, with 4GB of DDR3L dedicated RAM.

The model I was given to review had a 15in WLED touchscreen, but only possessed a 1366x768 resolution. HP has assured us the model does ship to customers with a 1080p display. As it was, the display on the review model looked OK. Due to the amount of screen real estate, the wide bezel bordering the display wasn't as pronounced as on smaller Envy laptops in their range.

HP has again given sound duties to Bang & Olufsen. The laptop has 4 speakers and a subwoofer. The sound is better than a typical laptop's, but you just won't get any meaningful audio from speakers that are small enough to fit in



a laptop. Don't expect earth-shattering bass from its subwoofer, but it does add more depth to what would normally be the usual tinny audio experience.

Having said that, it is a solid effort. There are plenty of connectivity options, a dedicated graphics card for casual 3D gaming, plenty of storage space, and a big screen for all of your movie watching needs.

Peter Gutierrez

KEY SPECS

\$1999 • www.hp.com

15in WLED touchscreen • Intel Core i7-5500U CPU • 8GB DDR3-1600 RAM • 2TB 5400rpm SATA HDD • 802.11ac Wi-Fi, 10/100 LA

OVERALL



Asus Transformer Book Flip TP200SA

A LIGHT AND COMPACT CONVERTIBLE LAPTOP THAT IS WELL MADE FOR THE PRICE, BUT LACKS GRUNT TO BE TRULY USEFUL

Cheap laptops generally don't equate to a solid physical design. The Asus TP200SA however, is remarkably well made for a laptop with an RRP of \$599. Compact with an 11.6" screen and weighing only 1.2kg, it will slip into a satchel bag easily, as will its compact power supply, which is about the size of a large USB charger.

The keyboard feels great to use and the connectivity options on such a small and thin laptop are high end. A USB 3.0 Type-C connector makes the TP200SA extremely versatile. Flipping the laptop around to use in tablet mode is quick and sturdy. The display is rich and vibrant, whilst not pro graphics quality, it's very legible and doesn't upset my precious eyes.

Unfortunately, that's where that's where good stuff ends. The low end Celeron N3050 CPU in this machine is

slow, which runs at over 50%, just using the Microsoft Edge browser. The laggard CPU is paired with far too little RAM – only 2GB! With the pre-installed bloatware hogging almost 1.7GB of that RAM in Windows, you're only left with 300MB free. Uninstalling all the apps helps a little, but 2GB is just not enough for Windows 10 to run on. 4GB of RAM should be the bare minimum on a new computer in 2015.

To make matters worse, the slow CPU and tiny amount of RAM is paired with an equally small amount of eMMC storage (32GB or 64GB). The speeds of an eMMC drive are barely acceptable on a tablet, let alone on a proper laptop running a full operating system. A SATA SSD would have been nice and made a world of difference.

These are the compromises a manufacturer makes to hit a price point.



Whilst it may be acceptable to some, for me the shortcomings are annoying to the point where I don't want to use the Asus TP200SA very often, making it a difficult purchase to recommend, despite the great physical form factor.

Anthony Agius

KEY SPECS

\$599 • www.asus.com.au

Intel Celeron N3050 Dual Core CPU • 2GB DDR3 RAM • 32GB SSD • 11.6" WXGA screen • 1.2kg, 802.11ac Wi-Fi • Windows 10 pre-installed • USB 3.0 Type-C • MicroSD card reader • Micro HDMI • 1x USB 3.0 • 1x USB 2.0.

OVERALL



Epson WorkForce ET-4550 EcoTank All-in-One Printer

EPSON KILLS THE INK CARTRIDGE SCAM

The only sure things in this life are death, taxes and the need to buy new printer ink cartridges every few months. Buying a set of new ink cartridges nowadays usually costs more than the price of the printer, and their low life span is the bane of every home office user's existence. Epson has come to the rescue with its revolutionary range of EcoTank printers, of which the ET-4550 is the flagship model. As you'll soon see, the days of ink cartridges are numbered.

The principle behind the EcoTank range is simple. Instead of using cartridges that only hold a tiny amount of liquid, Epson's latest printers instead have large ink tanks on one side of the printer. They hold a much larger amount of ink, which is delivered to the user in vacuum-sealed bags, and which must be squirted into each tank. We managed to complete this task with a minimum of fuss, with just a single drop of the black ink landing on our white desk. The ET-4550 comes with large ink bottles for the three primary colours (Yellow, Magenta and Cyan), as well as an even bigger black. It also includes a second set of smaller bottles as a free bonus.

What makes this system remarkable is the number of pages that each bottle can print. The large black bottle can print, wait for it, 11,000 pages before needing a refill. Yes, we said 11,000! That's the equivalent of around 50 ink cartridges,

which would set owners back around \$2000. By now you're probably expecting the bad news, that each replacement ink bottle costs upwards of several hundred dollars, but you'd be wrong. The large black ink bottle used by the ET-4550 costs just \$25, making each page cost a mere 0.22c each. We're not usually ones to get excited by printers, but this is simply an incredible leap forward for printer technology. As for colour pages, the numbers aren't quite so high, but they're still amazing. With the ink included in the box, the ET-4550 can print a whopping 8,500 pages, and the replacement cost for ink pots is the same as black. It's simply incredible compared to the way we've printed until now.

Obviously there's a trade-off, and it's the up-front price of the printer. However, even at this price the ET-4550 is outstanding value for money over the long term. If you'd like to spend a little less, the entry-level EcoTank starts at just \$450, and will print 4000 black pages, 6500 colour, with each bottle costing just \$16. After printing several colour game manuals and photos, we were very impressed by the print quality, matching other high-end ink-jet printers. It's also great at photo printing, provided you use the right paper. Epson's PrecisionCore technology ensures very accurate colour tones at this price point, and we think



▲ Refills are potentially messy, but in our experience went off without a spill

most people would be more than happy with the overall print quality delivered by the ET-4550.

We should also point out that this device includes a scanner and fax machine, which allows it to function as a copy machine. The inclusion of Wi-Fi means it can be easily shared across all of your devices on your Wi-Fi network, and setup was a breeze. If there's one complaint, it's that Epson's drivers also install a bunch of applications that aren't necessary to handle the basics of printing, scanning and faxing.

One final minor complaint is the size of the paper tray. Now that we're not scared to print out 600 page manuals for our favourite flight sims, the small paper tray is a bit of a limitation, with room for a mere 150 pages. It'd be nice to be able to load up a full 500 page package, and surely wouldn't have added to the cost of the printer.

Epson deserves the utmost credit for delivering the EcoTank range of printers. It's the death-knell for the sort of replaceable ink cartridges, which is as good for your wallet as it is the environment.

Bennett Ring



KEY SPECS

\$697 • www.epson.com.au

Max print resolution of 4800 x 1200 dpi • ISO Print speed • Black 13 ppm, Colour 7.3ppm • Automatic 2-side printing • Colour flatbed scanner with 2400 dpi optical resolution.

OVERALL





Samsung Galaxy Tab S2 8in

FAST, SLIM AND EQUIPPED WITH A WONDERFUL DISPLAY, THE TAB S2 IS AS GOOD AS COMPACT TABLETS GET

Harder, better, faster, stronger. It's almost as if Daft Punk had travelled into the future and written a song about Samsung's new Android tablet. The 8in Galaxy Tab S2 is designed to fill the premium Android hole in your life, and give Apple's iPad mini a run for its money.

Emerging from its packaging in a flurry of crinkly plastic and sparkly cardboard, the Tab S2 is the very definition of compact beauty, all slender metal shaped to perfection. Measuring 5.6mm from the glass at the front to its flat aluminium rear, it's as barely-there as tablets come.

In fact, it's so thin that the (surprisingly decent) 8-megapixel camera at the rear juts out by a couple of millimetres, a tiny metal ring serving to protect the slightly inset f/1.9 lens so you don't end up scratching it every time you plonk it on a table. Thankfully, the pared-down design doesn't mean Samsung has struggled to accommodate all the usual premium Android tablet features: you get nippy 802.11ac Wi-Fi (or 4G for around \$150 more), Bluetooth 4.1, a front-facing 2.1-megapixel camera and a microSD slot to expand the 32GB of storage.

All told, this looks and feels exactly like a high-end Android tablet should. Despite

weighing a feathery 265g – 66g lighter than the Apple iPad mini 3 – the metal shell is taut and flex-free. Everything about the Galaxy Tab S2 feels expensive.

Which brings me neatly onto the Tab S2's Super AMOLED display, which is absolutely delicious. The 4:3 aspect ratio screen feels more spacious than the 16:10 displays on the previous Tab S tablets, but it's the image quality that truly impresses. At least, once you switch off the excessive, oversaturated colours of its Adaptive Display mode. Switching to the boring-sounding Basic mode, on the other hand, provides some of the most well-balanced images we've seen on a tablet.

And the quality is truly superb. Our X-Rite iDisplay Pro colorimeter reported a maximum brightness of 334cd/m2 (contrast is effectively infinite due to the AMOLED technology), while the Basic mode successfully reproduced almost 99% of the sRGB colour space.

The 3GB of RAM and octa-core Exynos 7543 processor combine to create a superbly slick tablet: it darts back and forth eagerly between menus and applications, and scrolls smoothly through the most complex web pages. Its results of 1,256 and 4,276 in the single- and multi-core elements of the Geekbench 3

benchmark outpace every other compact tablet on the market.

It isn't an across-the-board victory, however, as gaming performance still isn't up with the best. An average frame rate of 20fps in the GFXBench 3.1 T-Rex HD onscreen test isn't bad, but the Intel Atom hardware in the Asus ZenPad S 8.0 manages 26fps. In fairness, there's more than enough power here to take on any of the latest Android games.

As ever, Samsung hasn't been able to resist tinkering with stock Android. It's also a slight disappointment that the Tab S2 ships with Android 5.0.2 beavered away under the TouchWiz skin rather than the very latest build, but Samsung has promised that an upgrade soon.

Thankfully, TouchWiz UI doesn't clutter up the tablet too much. There's both a clock and weather widget centre-stage on the homescreen; a few apps scattered around such as Samsung's S Planner calendar app, its own app store and the Microsoft Office apps; and also the Briefing newsfeed screen, which pops up when you swipe right on the homescreen. If the Samsung apps really get your goat, then you may find it annoying that you can't uninstall many of them, but they never bothered me.

There's one glaring problem with the fad for ever-slimmer tablets – it leaves precious little room for things such as the battery. And as the Tab S2 now relies on a relatively small 4,000mAh unit, which is 18% smaller than its predecessor, you'd expect stamina to take a hit. The move from a 28nm processor to a slightly more efficient 20nm CPU seems to have done the trick, though. With the screen calibrated to our usual 120cd/m2, and Wi-Fi switched off, the Samsung kept going for a creditable 14hrs 54mins.

So, what's the catch? Only that you'll now need to find \$600. That's a lot of money for an 8in tablet. The most important aspect of any tablet is the screen, though, and here the Galaxy Tab S2 just knocks it clean out of the park. Yes, it's expensive, but it's also refined, dainty and runs Android. If that's just what you've been looking for, you should just get it.

Sasha Muller

KEY SPECS

\$599 • www.samsung.com/au

Octa-core Exynos 7543 • ARM Mali-T760 • 3GB RAM • 32GB storage • 8in 1,536 x 2,048 Super AMOLED display • 802.11ac Wi-Fi • Bluetooth 4.1 • 4,000mAh battery • microSD • Android 5.0.2 • 8MP rear/2.1MP front cameras • 2yr RTB warranty • 134.8 x 5.6 x 198.6mm (WDH) • 265g

OVERALL



OnePlus 2

THE SECOND GENERATION OF ONEPLUS' AFFORDABLE FLAGSHIP HANDSET IS HERE, AND IT'S A VERY GOOD PHONE INDEED

The original OnePlus One was an incredible bargain – a smartphone costing less than \$400, yet capable of standing up to flagship phones from Samsung and Apple. The OnePlus 2 refines the formula, squeezing premium hardware into a phone that starts at a reasonable \$520 or so.

In the hand, the OnePlus 2 feels weighty and expensive. The buttons have a solid click to them; the magnesium-alloy frame doesn't bend when you twist it; and the finish feels impressively luxurious. I tried the Sandstone Black version, which has a rough texture that I really like; there's also a Kevlar option, plus wooden finishes in Bamboo, Rosewood and Black Apricot.

Wake it up and the 5.5in touchscreen looks bright and even, thanks to an IPS panel, although colours can appear a touch pale. In tests, it reached a maximum brightness of 415cd/m² and covered only 88% of the sRGB colour space. Don't get hung up on the resolution, though. Many recent flagships have featured Quad HD displays, but the OnePlus 2's 1080p resolution is perfectly sharp enough unless you want to look at it under a magnifying glass – or use it as a screen in a VR headset.

Below the screen sits a capacitive home button and shortcut keys. A fingerprint reader built into the home button works remarkably well; there's also a three-way toggle switch on the phone's left-hand edge, to quickly into Android's mute or Priority Interruptions modes.

A few design compromises are apparent. The OnePlus 2 isn't water-resistant; it lacks a microSD slot; and the battery isn't user-removable. Then again, the Samsung Galaxy S6 doesn't have those things, yet costs twice as much.

Inside sits the latest version of Qualcomm's octa-core Snapdragon 810 processor, backed by either 3GB or 4GB of RAM, depending on whether you pick the 16GB or 64GB model. This delivers performance that's faster than you're likely to need, even if you're a mobile-gaming fanatic: it achieved single- and multi-core Geekbench results of 972 and 3,018, with an average 43fps in the GFXBench T-Rex HD test.

Although OnePlus has ditched Cyanogen OS for this edition of its



smartphone, its Oxygen UI retains the "mostly pure" ethos of the first phone, running Android 5.1.1 with only minor modifications. You get a recent apps/contacts screen – called the "Shelf" – accessible with a right-swipe from the homescreen, plus a series of gestures to control the torch, camera or music player. Apart from that, it's squeaky clean.

Despite the phone's laser autofocus system, which locks onto subjects with uncanny speed, there's a momentary pause between hitting the shutter button and capture. Still, when you do grab the shot you want, photos generally look sharp and punchy: the 13-megapixel sensor is helped by an optical image stabilisation (OIS) system and wide f/2 aperture. Performance drops off in low light, with a good deal of noise obscuring detail indoors, but the dual-LED flash ensures that flash-lit subjects look normal.

Another slight disappointment is battery life. Despite its 3,300mAh lithium-polymer battery, the OnePlus 2 lags behind rivals, consuming battery capacity at a rate of 4.9% per hour while streaming audio over 4G (with the screen off), and 8.8% per hour while playing video in flight mode. It's not disastrous – the OnePlus 2 will easily get you through a day – but it's beaten by numerous other handsets, including the

^ Pick from a range of finishes, including the lovely Sandstone Black version shown here

Motorola Moto G.

Still, the OnePlus 2 remains an unbeatable bargain, especially the \$600 64GB version: no other manufacturer gives you this much storage for so little.

The handset will never be a mass-market success, the sales model pretty much ensures that. To get one you need to sign up and participate in OnePlus' various online activities, be invited by another OnePlus owner, or get lucky in one of OnePlus' occasional one-hour sales. However, if you have the opportunity to get your hands on a OnePlus 2, think very seriously about taking it.

Jonathan Bray

KEY SPECS

\$520

Octa-core 1.7GHz Qualcomm Snapdragon 810 v2.1 SoC • 3GB/4GB RAM • 16GB/64GB storage • 5.5in 1,080 x 1,920 IPS display • 13MP/5MP rear/front cameras • dual-band 802.11ac Wi-Fi 4G • 3,300mAh Li-Po battery • OxygenOS 2.1 (based on Android 5.1.1 Lollipop) • 1yr RTB warranty • 75 x 9.9 x 152mm (WDH) • 175g

OVERALL



Apple iPhone 6s

APPLE'S NEW IPHONE BRINGS IT BACK TO THE FOREFRONT OF MOBILE HARDWARE - BUT AT SOME COST

You know the script. Apple releases an "s" upgrade to its flagship phone, with a faster chip, a few more features, and a better camera. Apple fanboys upgrade; everyone else releases a sigh. Well, the iPhone 6s is something bigger. It represents the biggest leap forward for smartphones since the very first iPhone back in 2007.

3D TOUCH TAKES A BOW

The reason for this is 3D Touch, Apple's new take on touchscreen interaction. Put simply, the iPhone 6s is designed to respond not only to where and how long you press the screen, but how hard you do it. In effect, Apple is attempting to sense "intent" to draw users into an entirely intuitive action.

It's the sort of intention that's at the heart of all good interface and hardware design – the thing Apple has made a habit of executing successfully over the years – and 3D Touch pulls off exactly the same trick. The pressure-sensitive layer, coupled with a network of sensors behind the 6s' slightly pliable glass, can measure the distance between the glass and the LCD beneath with pinpoint accuracy. That means it not only senses that you're pressing the screen, but also how hard you're applying pressure.

In its most basic form, 3D Touch effectively adds right-click capability. Press the icon of a compatible app on the homescreen a little harder than usual and up pops a context-sensitive menu, offering options and shortcuts related to the app in question. The camera app gives you Selfie, Video, Slo-mo and Take Photo shortcuts; Safari offers up links to your reading list, bookmarks, as well as standard and private tab creation.

There are more sophisticated actions than this, though. Press the screen once – on a web link, for instance – and a preview of the web page appears. Slide your finger up and extra options for sharing and saving appear. Press harder and you pop off to somewhere else in the OS – Safari in this case. Apple calls these preview-then-launch behaviours "peek" and "pop".

3D Touch is implemented in many places across iOS 9. It can be used in the email app to take a quick look at messages without leaving the list view, to

view the new Live element of your photos (more on this later), and on the keyboard, where you can press then drag to reposition the cursor. In the Notes app, you can sketch with your finger and push harder for a heavier stroke.

From a hardware perspective, 3D Touch is beautifully implemented. You don't have to press too hard to activate the first level of pressure sensitivity, and the new Taptic Engine provides a tickle of feedback every time you reach a pressure threshold.

It's the sort of leap forward that may well transform the way we all use our phones in the future, much like the pinch-to-zoom and swipe-to-scroll gestures have. Admittedly, 3D Touch doesn't feel quite finished, with inconsistencies in the way it has been implemented, but that will change over time as app and (most excitingly) game developers get hold of the technology and try out new ideas. For now, 3D Touch only works with select Apple software and apps.

CAMERAS

The other major change on the iPhone 6s concerns the cameras, with the main, rear-facing shooter receiving a boost from 8 to 12 megapixels, and the front camera rising from a pitiful 1.2 to a more respectable 5 megapixels. Note that, just as with the iPhone 6, the iPhone 6s still lacks optical image stabilisation; that feature is enjoyed only by the larger iPhone 6s Plus model, making them slightly more accomplished in low light.

The new front-facing camera captures much more detailed shots, and has one ingenious feature that will help you capture better selfies, in low light: turn on the flash capability and the iPhone 6s will employ its screen as a makeshift flash.

Apple being Apple, though, it hasn't stopped there. Its screen-based flash is



a two-stage affair, flickering on once in bright white to provide full illumination, then again in a lower intensity yellowish colour in an attempt to balance the skin tones, a bit like the dual-tone LED flash on the rear. It works, too: although low-light selfies do still look pretty noisy, there's a reasonable amount of detail and skin tones look realistic.

A rise in the number of pixels is often accompanied by increased noise and, thus, lower quality. I've seen no evidence of that in the photographs I've captured so far. In low light and daylight, every snap has been well balanced in exposure, with perfect white balance and they've been bursting with detail.

Then there's the new Live Photos feature. Essentially, they're like always-on Vines built into the camera app, capturing 1.5 seconds of motion footage before and after you touch the shutter button. It's switched on by default, indicated by a small circular icon on the screen and a yellow LIVE indicator to show that video is being captured.

Most of the Live photos I captured when I first started using the phone ended with footage of the pavement, or my feet. For the best results, I slowly realised I needed to tweak my behaviour, and keep the camera pointed at its subject until the yellow indicator disappeared.

It's a fun feature, but will it become part of the fabric of social media, or

subside into obscurity over time? I suspect the former, but it will take time for the big social websites to build in support. Currently, only other Apple device owners are able to view Live Photos.

VIDEO CAPTURE

The other big camera news is that it can finally capture 4K video. The number of people who own devices capable of displaying such detail-packed footage is still small, but there's no denying that the video the iPhone 6s produces is much sharper than the 1080p footage captured by the iPhone 6. Still, what's likely to be more useful to more people is the iPhone 6s' ability to retain detail under zoom. Load the video into the preloaded iMovie video-editing app, which can now both process and export 4K footage.

4K is turned off by default. Clearly Apple is worried about customers with 16GB iPhones saturating their storage space, and for good reason: 4K footage chomps its way through around 380MB per minute.

DESIGN

The iPhone 6s isn't entirely identical to its predecessor. If you're used to handling an iPhone 6, you'll notice the first time you pick up a 6s that it's a touch heavier, primarily due to the extra electronics required to make 3D Touch work. It's also thicker, but it has expanded by such a small amount that I struggled to tell the difference, even with the two phones side by side on my desk.

Apple has made improvements to the materials employed in the iPhone 6s' design. The aluminium frame is built from a stronger alloy now – 7000 series aluminium to be precise – which happens to be among the strongest forms of aluminium available. The screen glass has been strengthened, too, although that's impossible to verify without trashing a handful of rather expensive iPhones.

The final design change is the addition of a fourth colour option – “Rose Gold” – to supplement the existing Gold, Space Grey and Silver models. In this humble reviewer's opinion, the new colour is execrable, but everyone's taste is different. You may well find you like it if you take the time to saunter down to your nearest Apple Store.

PERFORMANCE

And yes, the iPhone 6s is faster than it was last year. The new A9 processor, Apple would have us believe, is up to twice as fast as the A8 in the iPhone 6, while graphics performance is claimed to be faster still.

The GFXBench gaming test results are particularly illuminating: the iPhone 6s is so fast in the onscreen tests that its frame

IPHONE 6S VS 6S PLUS

The 6s Plus doesn't only give you a bigger screen to play with, it gives you a nominally sharper display, too. The 4.7in 1,334 x 750 screen on the iPhone 6s has 326 pixels per inch (ppi), while the Full HD panel on the 6s Plus delivers 401ppi. To the naked eye, however, the difference isn't perceptible. We've reached a point where extra pixels are doing little more than draining the battery.

Otherwise, there's very little difference between Apple's two new handsets. Both have the same processor, camera and wireless chips. The 6s Plus has a bigger battery, and if Apple's own figures can be trusted, it seems the benefits aren't entirely cancelled out by the larger screen. Apple claims the 6s Plus will deliver 14 hours of HD video playback, compared to only 11 on the 6s; 4G internet usage is pegged at 12 hours on the 6s Plus, compared to 11 hours on its smaller sibling. In practice, however, they're both going to go on charge every night.

rate is capped by the display's refresh rate, so results hover around 60fps.

It's only when you run the off-screen tests that you see how powerful the new A9's GPU has become, with the T-Rex HD test being dispatched with carelessness. No other phone I've tested has got anywhere near the iPhone 6s' 80fps result, and unlike some of the more powerful chips powering Android phones, Apple's flagship doesn't get uncomfortably hot to hold while achieving such heights.

What this means in the real world is less clear. To all intents and purposes, this is a phone that no modern app or game will stress, and in daily use you'll hardly notice the difference. Apps do launch a fraction of a second quicker. Transitions around the OS – from homescreen to the search screen and the new Siri Suggestions screen – feel ever-so-slightly speedier, too. The only aspect of real-world performance significantly quicker is the Touch ID sensor, which now offers almost instantaneous unlocking.

BATTERY LIFE

I was concerned to discover that Apple had, instead of increasing battery capacity to match the more powerful processor, reduced it. I'm pleased to report, though, no significant difference between the two phones in real-world use.

After a 5.30am start, and continuous testing, capturing lots of live photos and 4K video, installing apps, and listening to two hours of streaming audio over 4G, the iPhone 6s sat on 50% ten hours later. My full tests backed this up; for example, playing a 720p video in flight mode with the screen set to 120cd/m2 brightness saw a drop of 7.2% per hour. In short, this is a phone that offers solid, day-long stamina.

SCREEN QUALITY

On the surface, little has changed when it comes to the display. It's as bright as ever, with well-balanced colours across the board, but dim the backlight and there's a suggestion of greyness around the edges and corners. Still, given how much work Apple has done in squeezing the 3D Touch

system in and the Taptic Engine, I'm willing to forgive it this small indiscretion. And, in fact, when I measured with our X-rite iDisplay Pro colorimeter, it's clear this is still one of the best screens around.

It reaches a maximum brightness of 572cd/m2 and delivers an eye-popping contrast ratio of 1,599:2. Colour accuracy is exemplary, too, with the screen covering 95% of the sRGB colour space and its average Delta E (a measure of difference between the colours on screen and what they're supposed to look like) hits a superb 1.02. It's a match for the Samsung Galaxy S6 Edge's display, but without the intensely saturated colours.

VERDICT

Year after year, Apple has churned out new iPhones with great success, alternatively boosting power and camera resolution, then refining the design to the point at which it was tough to see where it could go next.

With 3D Touch, however, Apple has delivered the next step in the evolution of the smartphone – soon everyone will be copying it. It's done so without compromising screen quality or battery life, and has even found the time to improve the phone's cameras, its all-round resilience and the performance and internals.

However, if you want to be at the forefront of smartphone technology then there's nothing else to do but buy an Apple iPhone 6s. As luck would have it, it also happens to be a mighty fine smartphone.

Jonathan Bray

KEY SPECS

\$1079 • www.apple.com/au

Dual-core Apple A9 SoC with integrated M9 coprocessor • 2GB RAM • 16GB/64GB/128GB storage • 4.7in, 750 x 1,334 IPS display • 12MP/5MP rear/front cameras • dual-band 802.11ac Wi-Fi • 4G • fingerprint reader • NFC (for Apple Pay only) • 1,715mAh Li-ion battery • iOS 9 • 1yr RTB warranty • 67 x 71 x 138mm (WDH) | 143g

OVERALL



Eizo FlexScan EV2750

WHAT, NO 4K? EIZO SETS ITS SIGHTS ON BUILDING A PRACTICAL MONITOR FOR THE OFFICE - WITH PREDICTABLY GREAT RESULTS

Every time a new monitor arrives on my desk, I'm asked the same questions. Is it 4K? Is it OLED? Does it do 3D? In the case of the 27in FlexScan EV2750, the answer to all of these questions is no. In terms of cutting-edge technology, Eizo's latest monitor has little to show for itself. But then this is a display that's designed for the office, and, as business monitors go, the FlexScan EV2750 is pretty special.

The first surprise is how compact it is for a 27in monitor. Sat next to my everyday display, a Dell UltraSharp U2713H, the Eizo is far less imposing. A super-slim 7mm bezel runs around the panel, and the matte anti-glare screen coating even stretches over the bezel, which is surrounded by only a millimetre-thick ring of plastic.

The monitor's angular, contoured design is impressively slender, and the adjustable stand packs in all of the essentials without swallowing precious desk space. It provides 155mm of height adjustment, in addition to a generous amount of tilt and swivel, and the whole screen can rotate into portrait mode.

Eizo has something of an image-quality reputation to uphold, and the FlexScan EV2750 does it proud. The 2,560 x 1,440 IPS panel is almost perfect, and the matte anti-glare finish provides extremely wide viewing angles with no distracting reflections.

Brightness stretches from an unusually low minimum of 1cd/m² right up to 341cd/m² – and is

> The FlexScan is available in a fetching white option, as well as black



flicker-free due to the lack of pulse-width modulation (PWM) – while contrast reaches 935:1. Colour accuracy is superb, too. In testing, I found the factory-calibrated sRGB mode covered 98.8% of the sRGB gamut, with a low average Delta E of 1.6.

The consistency of the monitor's LED backlighting is also impressive, with only a 8.5% drop in brightness in the top-right corner, and an average variance across the screen of 3%. Colour temperature is stable, with no obvious shifts in tone. Colours look even and clean across the entire width of the display.

Along with two configurable modes, there are also pre-calibrated sRGB and DICOM (the standard for medical displays) modes and a "Paper" mode that reduces the white level and contrast for easier reading. The supplied

ScreenManager Pro software provides support for circadian dimming, which adjusts the screen's colour temperature setting to suit the time of day.

If you're wondering what makes this specifically a business monitor, then the FlexScan EV2750 has a few answers. Perhaps the most useful feature is Eizo's Auto EcoView, which adjusts the display's backlight to best suit on-screen content, as well as ambient lighting conditions.

A sensor on the lower bezel deals with the

brightness, and the shifts are subtle, smooth and unintrusive. Maximum and minimum brightness settings can be tweaked to better suit the lighting conditions, too.

Eizo's EcoView Optimizer goes one step further by reacting to the content displayed on-screen and reducing the backlight brightness accordingly. For darker content, it reduces the brightness of the backlight and boosts the gain applied to the incoming image signal, ensuring that everything remains visible. This gives images a slightly washed-out effect, but it reduces running costs. It's also possible to save the FlexScan EV2750's image and EcoView settings to an XML file and – as long as each computer has Eizo's EvoView NET software installed – deploy them over an office network.

The FlexScan EV2750 is an excellent monitor. It's expensive compared to consumer displays, but take into account the variety of useful power-saving features, and the five-year warranty, and the Eizo goes a long way towards justifying its high price.

Sasha Muller

KEY SPECS

\$1300 • www.eizo.com

27in 2,560 x 1,440 IPS • DisplayPort • HDMI • DVI • 2 x USB 3 • 3.5mm audio out • 5yr RTB warranty • 612 x 245 x 390-545mm (WDH) •

OVERALL





Asus PG279Q

BUILT FOR SUPER-HUMAN SPEEDS

We're all familiar with CPU, GPU and memory overclocking, but over the last few years another PC component has been at the heart of a niche group of tweekers. It turns out that several very affordable Korean monitors are highly overlockable, with the ability to run refresh rates almost double that of their official standard. Asus has taken note of this trend, and has applied a factory overclock to its latest gaming display, the PG279Q. With an out-of-the-box refresh rate of a rather insane 165Hz, it's the fastest gaming display ever officially sold at this speed. But how fast is too fast?

The panel used within this display is actually designed to hit 144Hz, but enabling the overclock option via the OSD brings it all the way up to 165Hz. To be frank, even our discerning eyes couldn't pick the 21Hz increase over the 144Hz standard, but for those who demand the fastest components around, the 165Hz refresh rate will be a big deal. We're more impressed with the fact that Asus has

squeezed this refresh rate out of an IPS display. Until recently 100Hz and above was the domain of TN panels, helping to compensate for their narrow viewing angles and weaker colour reproduction. Yet Asus has been leading the high-speed IPS charge for a while now, delivering all the benefits of these beautiful displays with the high frame rates that serious gamers crave.

In case you've forgotten, IPS panels have a much wider viewing angle, at 178 degrees. This makes them especially good for larger displays like the 27 inches found here, as the edges of the screen don't suffer from the colour and brightness bleed that big TN panels endure. They also have much more vivid and accurate colour reproduction. Throw in category-leading contrast performance, which gives the image much finer detail, especially in the shadows, and it's obvious why IPS is now the display type of choice.

If there's one thing that isn't so great about this display, it's the native HD

resolution of 2560 x 1440. At this size pixel structure still isn't visible, but when compared to the new breed of Ultra HD, 4K and Retina displays that are doing the rounds, it's a step backwards. The benefit is that you won't need four Titan X graphics cards to power a 4K screen at 165Hz. A couple of GeForce GTX 980 Ti cards should do a very capable job.

Asus has gone with Nvidia's G-Sync technology on this display, tying its refresh rate to the framerate of the game you're playing. This is still the superior adaptive sync technology of the moment when compared to FreeSync and Adaptive-Sync, though the latter are catching up. As such, you'll need to pair this display with Nvidia GPUs to make the most of it. Even better, Asus has also delivered G-Sync in conjunction with its Trace Free technology, which is similar to the overdrive technology used on other high-speed displays. This removes any form of motion blur, delivering one of the most solid, smooth images we've seen on a display.

There are a couple of niggles with this display though. First is the cost – at \$1200 you can buy a decent entry-level projector for the same price, or a good quality 4K panel that is even bigger, albeit without adaptive sync technology. Secondly, with Intel recently announcing that it's backing the Adaptive-Sync specification instead of G-Sync, Nvidia's proprietary technology seems destined for obsolescence in the near-ish future. It'll still be around for a few years at least though, hopefully, lest Nvidia upset the early adopters who have spent so much money on their tech. Finally, the displays onscreen framerate counter seems a little buggy – it only appears to show the framerate at the moment it's turned on, and doesn't seem to update as the framerate changes. It's a minor issue though, especially as running FRAPS or Afterburner will deliver the same via software for free.

If money is no obstacle and you're looking for a screen that can keep up with your cybernetically enhanced eyeballs, there is no substitute – they just don't make them faster than this. Add excellent image quality and blur-free gaming and you've got one of the finest gaming displays on the market.

Bennett Ring

KEY SPECS

\$1199 • www.asus.com.au

27 inch diagonal viewing area • 2560 x 1440 native resolution • G-Sync compatible

OVERALL



PHANTOM-S

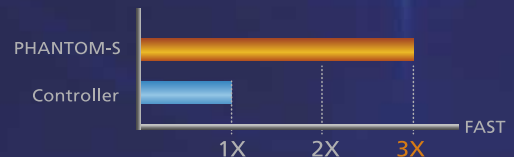
GAMEPAD EMULATOR

Can't Aim and Shoot Fast Enough or Accurately When Playing FPS Games on PS4, PS3, XBOX 360 or XBOX One?

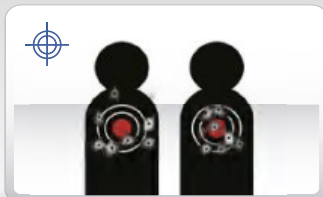
PHANTOM-S™ IS THE ANSWER !

The PHANTOM-S™ uses signal conversion technology for advanced control during gameplay. You can abandon the conventional controller for FPS games to enjoy smoother movement, enhanced accuracy, customized controls and rapid fire with a PC keyboard and mouse.

The PHANTOM-S™ allows you to easily become a top FPS player with customized keyboard and mouse controls like you've never experienced. Whether you're a professional PC or console game player, the PHANTOM-S gives you the advantage.



Aim Better



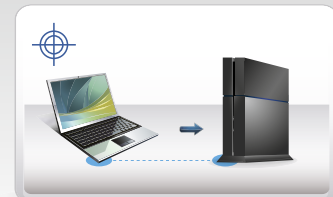
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Rapid fire

Regular Software Updates



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Boosts Performance

Unique Play Mode



Use a Laptop / Desktop keyboard
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Acer Predator XR341CK

A DELIGHT TO USE AND REASONABLE VALUE FOR WHAT YOU GET

The sudden, massive, and accelerating evolution in monitors is as remarkable as it is rewarding. We have 4k screens getting bigger and cheaper, curved is now a thing, ultra-wide 21:9 aspect ratios are common, and for gamers it's never been more exciting with FreeSync, G-Sync and AdaptiveSync smoothing out the frames.

For gamers, this is one monitor we have been keenly waiting for



with interest. It ticks many key boxes bringing together the most compelling new technologies and features. The Acer XR341CK's panel is 3400x1440 resolution, and the ultrawide format works extremely well with shooters and racing games, but the relatively short height is still an issue for strategy and flight games. Still, I regard 1440 as the minimum acceptable vertical res and the benefits of curved immersion and 21:9 make it worthwhile, and the 4ms response time is definitely in the sweet spot.

The stand is nearly perfect, with the feet spread wide apart so you can pull it up close. I did find positioning the mouse pad tricky – it's either on the far side of the right feet, and thus too far away, or to the left, and thus too close to the centre. The upcoming Acer Z35 solves this with an even wider design for greater flexibility. Height is adjustable, but not tilt, though the monitor is very light so positioning it was easy. Speakers are built-in, but I'd be surprised if they ever got much use, at this price for a gaming rig you would be likely

to have external speakers. I didn't like the OSD controls, they get the job done but were unintuitive, with the system used trying to squeeze maximum functionality from too few multi-function buttons.

This panel supports Adaptive-Sync and FreeSync, and testing with supported games via an Nvidia 980Ti gave smooth results. A G-Sync model (the X34) is on the way, it's \$400 more expensive, though, underlining Nvidia's premium for that technology, but aside from G-Sync you do get a 100Hz refresh in that model.

Overall it's a gem, and is the one to get for AMD video card owners at the moment.

Ben Mansill

KEY SPECS

\$1499 • www.acer.com.au

34inch diagonal viewing area • 3400 x 1440 native resolution • Adaptive-sync/FreeSync • 75Hz refresh rate

OVERALL



LG 27MU67 27" 4K Monitor

AMD FREESYNC MAKES THIS 4K MONITOR IDEAL FOR GAMING AT HIGH RESOLUTIONS WITH AN AMD GRAPHICS CARD

LG's newest 4K display, the 27MU67, is designed to bring the best out of the modern game engines with 4K support. The killer feature here is AMD's FreeSync, a technology designed to work with AMD graphics cards to pair up with compatible monitors and reduce frame-skipping, tearing and overall smoothness of gameplay.

Once you've taken the monitor out of the box, get your screwdriver out – you'll need it to attach the stand to the screen. The stand is solid though and lets you rotate the display into portrait or landscape. But other than that, setup is straightforward and LG is even nice enough to include high quality Mini DisplayPort to DisplayPort and HDMI 2.0 cables. A relatively thin and basic bezel gets out of the way so you can concentrate on the image.

Thanks to the IPS panel and 99% sRGB colour gamut, the colours on this screen are fantastic, with little drop-off of image quality if you're not looking at it directly in the centre of the screen.

Most hardcore gamers prefer a monitor without an IPS panel for faster response times in action packed FPS titles. But most people will probably appreciate the colour quality of the IPS panel rather than an extra millisecond or two of response time – despite that the 27MU67 holds its own with a 5ms response time.

The inclusion of AMD FreeSync support is great, but only useful if you have an AMD graphics card which supports it. Nvidia has a similar

technology called G-Sync which of course, works on Nvidia cards only and on monitors with G-Sync support. This monitor will work fine on an Nvidia card, but you don't get the benefit of AMD's FreeSync tech.

4K gaming is fantastic if you have the video card grunt to go with it. The gameplay looks so sharp and clear versus 1080p graphics. With the LG 27MU67's IPS panel and AMD FreeSync support to keep everything smooth, there's not much more you could ask for in a 4K gaming monitor.

Anthony Agius

KEY SPECS

\$899 • www.lg.com.au

27-inch diagonal • 3840x2160 UHD resolution • IPS panel • 99% sRGB • AMD FreeSync • 178 degree viewing angle • 2x HDMI 2.0 ports • 1x DisplayPort • 1x Mini DisplayPort • 5ms response time.

OVERALL





✓ Installation was simple, with the devices configuring automatically

D-Link PowerLine AV2 2000 Gigabit Network Kit (DHP701AV)

MOST IMPRESSIVE PERFORMANCE

While Wi-Fi hardware vendors continue to make bold claims about ever-increasing speeds of wireless connectivity, a rival method of setting up a SOHO network has continued to quietly evolve in the background. Ethernet over Power, or EoP for short, uses your home or office's electrical wiring to deliver data between two power points. In the early days of EoP, reliability and performance were both extremely lacking, but these issues have long since been solved. D-Link's newest EoP kit is a prime example of how far the technology has come, promising to deliver Gigabit speeds if your home's wiring is good enough.

Many devices claim to be plug and play, but none are truly as easy as this kit. Two adaptors are included, and it's simply a matter of plugging them into the two power points that you want joined by a network. There's one issue though, in that both power points must be on the same circuit. That means that both power points are connected via a power line, and an easy way to test is via your circuit-breaker box. Flick each switch one at a time until you find the one that is connected to the power points. If both

stop working when a single circuit-breaker is deactivated, it means they're both on the same circuit. However, if one stops working while the other remains live, they're on different circuits, and the kit won't work.

If both power points are on the same circuit, all three diagnostic LEDs on the adaptors will light up. Figuring out what each light means isn't easy though, as there's no manual in the box other than a cryptic sheet with weird diagrams. It'd be nice if D-Link included a few pages explaining what each light means, and how to enable encryption over the network (this is done by pressing the button on each adaptor). One issue we have with installing the adaptors is their large size. When installed on a power point with two outlets, they're so large that they effectively block out the second power point – it'd be nice if they were angled sideways instead of upwards, or came with a small extension cable. There's also no pass-through port so you can still use the power point, a feature which is becoming more common on competing adaptors.

Once the two adaptors are in place, they should synchronise within 120

seconds. Just like with Wi-Fi, EoP performance varies wildly depending on your environment. Factors such as distance, line quality and interference will all impact the throughput of this technology, but D-Link claims it'll deliver Gigabit speeds in the best conditions. In fact, they claim it'll handle 2000Mbit/sec, the fastest EoP kit on the market. However, it uses the AV2 standard, which is only rated up to 1500Mbit/sec, so this claim is a little dodgy.

We tested this kit in a recently renovated worker's cottage in the Melbourne inner-city suburb of Brunswick, which had been rewired just 12 months ago. Using the excellent LAN Speed Test application, we measured the throughput when transferring a 1GB file. Over three tests we averaged a speed of 421 Mbps, which is an excellent result. Obviously it's not as fast as dedicated Ethernet cables, but installation is a heck of a lot simpler.

However, D-Link isn't the only maker of AV2 EoP kits, and our concerns with the form factor make it one of the least usable. It's also one of the more expensive kits on the market, a fact which is offset by its excellent performance. If D-Link can improve the size and design of the adaptors it'll be a killer kit, but it's already one of the fastest kits on the market.

Bennett Ring

KEY SPECS

\$169 • www.dlink.com.au

PowerLine AV2 2000 technology • 1 x Ethernet port per Adaptor • D-Link Green Power Saving

OVERALL



Sony SmartBand 2 SWR12

A GOOD CHOICE IF YOU WANT A WATERPROOF, FIT-AND-FORGET TRACKER - COMPLETE WITH A HEART-RATE MONITOR



Choosing a fitness tracker in 2015 is tough. There are hundreds of products vying for your attention, from apps to specialist devices for athletes. The SmartBand 2 aims to appeal by including a heart-rate monitor in a fit-and-forget design that can even survive the swimming pool.

To be precise, it's IP68-compliant, making it fully waterproof. All of the tracking hardware, including the optical heart-rate sensor, is contained within a tiny, curved module that snaps into the rear of a soft, silicon-rubber wristband.

The band's design is attractive and minimalist, whether you choose the white or black version; pink and indigo versions are on the way. Sony has improved upon the design of the latch with the SmartBand 2, introducing a metal buckle that secures the tracker firmly to your wrist. It's comfortable to wear, too.

There's a single button on one side that switches the device on and off, snoozes alarms and performs various other tasks. It's accompanied by three status LEDs, which indicate charge, connection and mode.

There's no display for the time or for monitoring your steps. As you carry out your daily activities, the SmartBand 2 uses an accelerometer to track your steps, sleep and calorie burn, while the heart-rate monitor takes stock of your pulse at regular intervals – around six times per hour by default – and delivers its verdict on your stress levels. It does this by tracking your heart-rate variability (HRV): the steadier your heart rate, the more relaxed you are; the more variation in the time between beats, the more stressed you are.

✓ The built-in optical heart-rate sensor is the star of the show



While you're working out, you can put the SmartBand 2 into continuous measurement mode for increased accuracy with a double-press on the device's button. Most of the time, though, you can let it be. You don't need to input whether you're running, walking or sleeping – it should be able to tell the difference and log it automatically.

I say should, because this is one of the SmartBand 2's weaknesses: it regularly made rudimentary mistakes about the type of activity I was doing. It thought I was asleep when I was sitting on the sofa watching TV, and on more than one occasion logged me "running" when I was doing nothing of the sort. I'm also disappointed to see no tracking for swimming, cycling or workouts.

There are, however, a handful of bonus features here. The first is a smart alarm that monitors your sleep patterns, only waking you when you're sleeping lightly so that you don't wake up groggy. There's also rudimentary music control. Press the button and you can tap to pause, play, and skip tracks on your phone. And the SmartBand 2 can be set to buzz when you receive notifications.

Battery life is reasonable, charging via micro-USB in around an hour, and lasting roughly two days per charge with the heart-rate monitor enabled. Usefully, the SmartBand 2 also has a Stamina mode, which switches off the heart-rate monitor.

All of the data, analysis and settings are accessed through the accompanying smartphone app, and it's good to see support for both iPhone (iOS 8.2 or later) and Android handsets (4.4 or later). On both platforms, the SmartBand 2 app is required for connection and to view current stats, such as live heart rate, today's steps, sleep and running time, with another app taking over for historic data. On Android, the Sony Lifelog app fulfils that duty; on an iPhone you use Apple

Health. Android users who prefer to use Google Fit can also have tracking data automatically transferred there.

Setup is straightforward, with connection taking place almost instantaneously. There's onboard near-field communication (NFC) to help Android users connect more quickly simply by touching phone and wristband together. The apps are fairly easy to use, too, although I prefer the Android software over the iOS app. There's more information available to help you interpret your results, and the Sony Lifelog app presents your fitness data in a far more detailed and helpful way than Apple Health.

However, there appears to be little point to the heart activity mode. This monitors your pulse more frequently than when the SmartBand 2 is in background tracking mode, but there's no way you can view these activities in detail in the software, which is disappointing.

That said, the Sony SmartBand 2 is a decent fitness tracker for the money, and delivers more useful heart-rate data than the Jawbone UP3, which tracks your pulse only while you're sleeping. Even so, I'd expect more accurate activity tracking in this product, along with a greater variety of activities to track. As such, it's worth investigating alternatives such as the Fitbit Charge HR, which includes both a heart-rate sensor and OLED display for around the same price.

Jonathan Bray

KEY SPECS

\$138 • www.sony.com.au

Accelerometer • optical heart-rate sensor • IP68 rating for dust and water resistance • 3 x status LEDs • NFC • Bluetooth LE, iOS (8.2 or later) and Android (4.4 or later) support • micro-USB charging • 1yr RTB warranty

OVERALL



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Introducing the NEW **SAPPHIRE R9 Tri-X 390X** graphics card.

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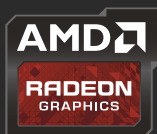
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Apple iPad Pro

THE 12.9IN IPAD IS POWERFUL AND EXPENSIVE, BUT TURNS APPLE'S TABLET INTO A TRULY PROFESSIONAL TOOL

While overshadowed by the iPhone 6s, the really big news from Apple this month is the 12.9in iPad Pro. I was fortunate enough to spend some time with the device – and it's a colossal new product from Apple.

To think of the iPad Pro as simply another iPad doesn't do it justice. It has more in common with Microsoft's Surface and represents a major step into the business market for Apple.

Before I got my hands on the Pro, I was struggling with the question: "What can the Pro do that the iPad Air can't?" However, after spending a brief period of time with the device, its forte became clear: multitasking.

The iPhone 6s' 3D Touch allows users to get a snippet of information without having to leave an app, and the iPad Pro's increased screen size and beefed-up processing power achieve effectively the same thing. How? The iPad Pro uses its big screen to either display two apps side by side, or float one app on top of another.

The display itself is incredible. It's big, bright and packs 5.6 million pixels into its 12.9in, 2,372 x 2,048 (264ppi) Retina display. Apple still claims a ten-hour battery life, thanks in part to new techniques, such as the ability to dynamically slow down the refresh rate of the screen in order to preserve power. It also helps that there's more room for the battery to stretch out inside.

That's due to the iPad Pro being much bigger than you think. Using it is similar to how a ten-year-old must feel when he gets his hands on a regular iPad. I found that holding the device between the corner of my elbow and hand enabled me to operate the Pro with ease and comfort, but this is a device that's clearly been designed for use on a table or another flat surface. This is where the iPad Pro is most like the Surface Pro, but it loses points for not having a touchpad option – something I instinctively hunt for when using any laptop-type keyboard. As with the Surface Pro's Type Cover, Apple's variant doubles up as a screen protector, stand and cover. It's expensive, but typing on it is a joy, with each keystroke rewarded with a very satisfying thud.



▲ The 12.9in screen brings a new dimension to Apple's iPad range

The other main accessory is the Apple Pencil, which I instantly fell in love with. It won me over when the Apple representative was sketching something. He suddenly stopped using the nib of the pen, tilted the Pencil 45 degrees and began shading the picture with a lifelike pencil-shade effect.

The very slender Pencil is attractive in its own right, but it's also functional, with its battery lasting three months at a time. When you eventually run out of power, the lid can be removed to reveal a Lightning connector, which enables you to charge it via the iPad Pro's Lightning port. Very neat.

Inside the iPad Pro is the new A9X SoC

(system on a chip), which Apple claims delivers increased power over the A8X chip in the iPad Air 2, including twice the memory bandwidth and superior graphics performance. The impact I witnessed this having on the iPad Pro wasn't as impressive as I'd expected. I noticed a small amount of lag when I began to float a video over the Pro's Safari browser. While

"The iPad Pro has more in common with Microsoft's Surface and represents a major step into the business market for Apple"

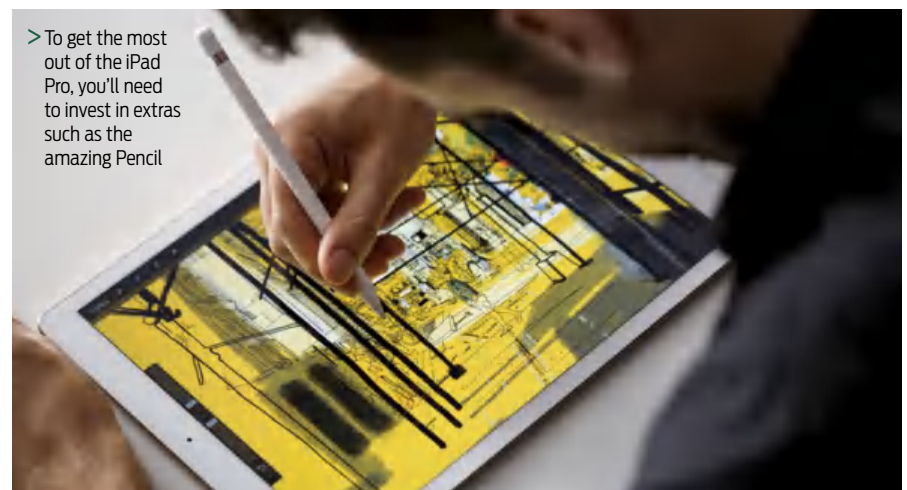
barely noticeable, it could be a sign of how much strain the iPad Pro's internals will be put under when multitasking on such a big screen. It's something you can expect us to test closely when we get the device into our labs.

There are no official Australian prices as of yet, but the 32GB iPad Pro will cost US\$799 (Wi-Fi only), the 128GB is US\$949 and the 4G 128GB is US\$1,079. Add the Smart Keyboard and Pencil and you're looking at a minimum of US\$1,067 for the full package, which means its certainly no impulse buy, even with a generous dollar-to-pound conversion rate.

Tim Cook was right when he stood on stage at San Francisco's Bill Graham Civic Auditorium and said: "Today we have the biggest news in iPad since the iPad." It's a new beast.

There's so much to like about the new iPad Pro: the size and power, as well as the Smart Keyboard and Apple Pencil. However, will it be enough to reignite the supposedly waning enthusiasm for iPads? Very possibly. Look out for our full review when we get our hands on the final version.

David Court



> To get the most out of the iPad Pro, you'll need to invest in extras such as the amazing Pencil

Labs Apps

Moodnotes

\$5.99 · iOS

If you're already counting your daily steps, tracking sleep cycles and monitoring metrics such as food intake to body temperature, you'll be well acquainted with the idea of the "quantified self" – the notion that data-gathering can help you achieve and maintain physical wellbeing.

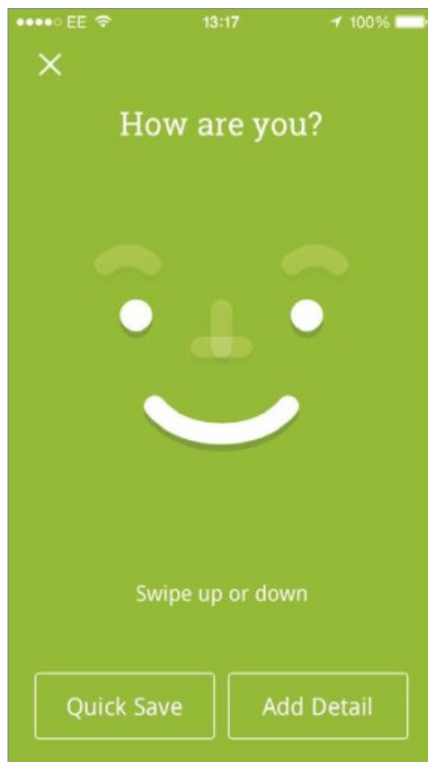
Thriveport's Moodnotes is a simple tracking app that extends the idea to emotional states. Created by Ustwo, the development team behind the beautiful, mind-bending game Monument Valley,

"The intuitive interface makes Moodnotes a friendly and attractive way to track your mental wellbeing"

its interface is very straightforward: opening the app reveals a friendly-looking graphic of a face. With a quick swipe up or down, you can match the face to your current mood. Then you're asked to log how you're feeling, on a seven-point scale from terrific joy to dire despair.

The next stage draws on techniques from cognitive behavioural therapy (CBT). If you've indicated a negative mood, Moodnotes invites you to describe your thoughts and to consider whether you've fallen into one of 14 common "thinking traps", such as "mind-reading" (jumping to conclusions about other people's thoughts), "catastrophising" (blowing events out of proportion) or simply failing to see the positives in a situation. If you're firmly in the smiley zone, the app invites you to reflect again, in order to encourage happy-making thinking habits. You can then rescore your feelings and note whether you feel better. Once you've used Moodnotes for a while, you can use the timeline view to track how your moods have changed over time.

Beyond that there are no other features: it's pretty simple. But the intuitive interface makes Moodnotes a friendly and attractive way to track



^ The interface is straightforward: just swipe up or down to log your mood

your mental wellbeing. While the app lacks an official medical endorsement, the CBT techniques it draws on are recommended by the NHS to combat stress, anxiety disorders and some types of depression.

The only question is whether it will appeal to you, which may depend on your level of faith in self-quantifying. Unlike a health-monitoring device, Moodnotes has no way to automatically detect your mood, or to tell you what your thinking trap is – and there's no fixed schedule for using it either. To get the best out of the app, you must want to use it, even more so than a wearable fitness device that, to an extent, does the measuring for you. Still, it's well designed and can certainly be helpful.

For the low price, it's well worth a try for anyone who wants to start managing their moods.

Lise Smith

OVERALL



Bounts

FREE (with in-app purchases) · Android and iOS

Having trouble getting incentivised to use all those fitness apps? Bounts to the rescue – it plugs into other fitness apps and devices including Fitbit, Moves, Jawbone, MapMyFitness, Strava, Runkeeper and more, and offers monetary rewards for your hard work.

By connecting apps, Bounts translates your workout into points – capped at 15 per day for the free app, and higher for a paid subscription. Points can then be exchanged for vouchers for brands such as Amazon, WHSmith, Tesco and iTunes. You can even undo all your good work with Pizza Express vouchers.

Alan Martin

OVERALL



^ A Reward Wheel lets you spin for the chance to earn more points

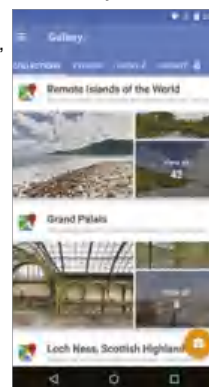
Google Street View

FREE · Android and iOS

Google's Street View gets a standalone release with this app. As well as browsing Google's own Street View images, the app lets you explore panoramic shots by users from all over the globe. If nothing else, the app is worth downloading for the tool that lets you make 360-degree photographs using your phone's camera. After you've made a 360-degree photo, you can publish it to Google Maps as a spherical image or share it privately as a flat picture.

Thomas McMullan

OVERALL



^ Explore panoramic shots taken by others

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INSIDE
SPORT



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Winners will be announced at the Ultimate Sport Expo at Melbourne Showground (November 21-23).

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You'll find all the information you need there, including the judging criteria and process, plus the terms and conditions.



HYUNDAI iMAX For Lives Lived Large

iMax offers exceptional seating flexibility for eight people plus cargo, in a stylish shuttle

Labs Briefs

Adata SP550 SSD

\$125 (240GB) • www.adata.com

This affordable SSD pairs a Jmicron controller with MLC NAND, which is the good stuff. We tested the 240GB model, which after formatting yielded 223GB of useable space.

Read speed was very respectable at 519MB/s, which isn't far short of what we would expect from an SSD closer to premium price-points, write speed, however, was unspectacular at just 409MB/s, using AS SSD.

But of course this is a budget drive, and if you are looking at using one of these to speed up your system or replace a mechanical hard drive you certainly won't be disappointed. Its closest competitor in the market is probably the OCZ Trion 100, which yielded similar read speeds but the OCZ blasted ahead with write speeds closer to 480MB/s.

In terms of price the SP550 stacks up fairly evenly, with OCZ's 240GB Trion 100 budget drive currently available for just under \$120, and Crucial's similar BX100 at \$135 for the 250GB version.

Ben Mansill

OVERALL



Gigabyte Aire M60

\$49 • www.gigabyte.com.au

The new marketing buzzword is '4k-ready'. In mouse terms, that means a high DPI, because that enables greater fidelity across more pixel real estate. The Aire M60 hits a high of 3200DPI, and it's no shallow marketing claim that this is a winner for high res screens. While it all depends on the sort of work you do, design and image manipulation definitely sees a benefit.

Being a laser sensor, it will work well on any old surface, at the slight expense of the smoothness an optical sensor offers.

It slides down to 1000 and 1600DPI, should you decide you like the look of this mouse for standard res. And for less than fifty bucks it's very nice indeed, most notable is its claimed two-year operating life from the two (supplied) AA batteries.

In the hand it's light and well sized, with an excellent thumb-rest area. Personally I found the movement a little too quick, but that's coming from a 1200 DPI mouse. One adapts quickly to these things.

Ben Mansill

OVERALL



Microsoft Foldable Keyboard

\$129 • www.microsoft.com.au

Microsoft's leveraging its Surface tablet keyboard knowledge with a slim new product that works with any device, be it Android or even iOS powered. The Microsoft Foldable Keyboard simply connects via Bluetooth, and away you type.

It's certainly impressively small, making it perfect if you need a back-up keyboard for a mobile phone – it'll easily fit into a large pocket. Unfolding it turns it on, and connection is a breeze. The chiclet-style keys are understandably short on travel, but is an undeniable improvement over onscreen versions. And a single charge will last for three months, making it just a great back-up to carry in case you really need to type something longer than the usual social media updates.

That said, it can't compete with dedicated keyboard-style covers, or even devices such as Apple's stand Bluetooth model. The hinge is obtrusive, and makes mis-keys easy to achieve. But its convenience and build quality cannot be denied.

David Hollingworth

OVERALL



Seagate Backup Plus Slim

\$99 (500GB), \$129 (1TB), \$209 (2TB)
• www.seagate.com/au

Here's another portable hard drive. It's available in 500GB, 1TB and 2TB in capacities, has a nice metal case, isn't awkwardly large, has a USB 3 connector and comes with 200GB of free OneDrive cloud storage for two years. You can have yours in black or silver, both look good.

So, no big deal. It does, however, have a rather nice bit of backup software included which is quite nice to use. On a PC it'll do backups continuously in the background, or, should you choose, run them on a schedule. For Mac it's best to use Time Machine.

It'll also automatically save photos and videos from all the popular social media sites, including Facebook, twitter and, impressively, Youtube.

Ben Mansill

OVERALL



Bose SoundTouch 10 speaker

\$299 · www.bose.com.au

Bose has been renowned for producing great consumer speaker products for years, and the SoundTouch range is no exception. The new SoundTouch 10 is a versatile Bluetooth powered speaker that delivers incredibly clear sounds, while still being able to fill a room with wonderful music. Bluetooth connectivity is simple, and the Bose APP lets you set up to six pre-assigned presets – playlists, music service, etc. – and these can be set on a per-device basis, making the SoundTouch 10 great to have across multiple rooms, for multiple users.

And, one set, you're not tied down to your phone to control them, either. Both the included remote and the speaker itself has six buttons that let you control the presets natively. A future update will add more Spotify integration, too, so if that's your music streamer of choice, the SoundTouch 10 becomes even more attractive.

It may be pricey, but this speaker is very versatile.

David Hollingworth

OVERALL



Seagate Game Drive for Xbox One and 360

\$179 (2TB) · www.seagate.com.au

Another portable hard drive! This one is actually a little interesting, which has tech reviewers around the world rejoicing. It's for your Xbox, which if you're of that persuasion, is something generally necessary. Half a dozen AAA games will saturate even a 1TB Xbox drive, so the additional 2TB this offers is most welcome.

Performance seems snappy.

Unfortunately we couldn't bench test it because to function as intended it needs Xbox formatting. That means you can't use it on both platforms, too.

It's a bit of a chore when you first plug it in to copy your games over one by one. Group selection would be nice, but that's a failing of the Xbox UX, not this drive.

And yes, you can buy any old non-Xbox-branded drive and use that instead, but for the \$10 or so premium, true Xbox fans will know that the green case and branding are requisite.

Ben Mansill

OVERALL



Panasonic Lumix GX8

\$1499 · www.panasonic.com.au

Panasonic's latest compact system camera looks like a blocky, retro throwback, but still feels great in the hand, and offers all of the usual features we've come to expect from the Lumix family. It's very well made, and its magnesium alloy frame will handle a lot of abuse. It's a little weightier than some of its stablemates, but that does mean good real-estate for plenty buttons and controls, and nearly all of these are placed in easy reach of your right-hand thumb. The digital viewfinder can swivel up for shooting at odd angles, and offers great image quality, as does the OLED touch-capable rear screen.

The 20.3 megapixel Micro Four Thirds sensor delivers great detail and low range ISO, with excellent RAW results. The GX8 can also shoot great 4K video at 24 or 25 frames per second. But it's the GX8's superb controls that really set it apart. It may not be the handiest camera, but its features more than make up for its size.

David Hollingworth

OVERALL



Aten Tap

\$79.95 · www.aten.com

This is certainly a bit of a niche product, but if you do find yourself constantly switching between your PC and a tablet or phone to stay in touch with various streams of work or communication, it could very well come in handy. The Tap is a Bluetooth powered KVM – you plug your keyboard into it, then it into your PC, and you can easily switch between normal typing, and typing on whatever device you've got connected.

It's a well-made little device, though it does only work with iOS. That said, it can connect two devices, and offers mouse support. Still, in use it's just as convenient to type on your main keyboard, and then tap any needed touch controls. The only real drawback to the device is the short length of its hardwired cable, making it less than ideal if your computer isn't close to your desk – if it's on the floor it's really not going to work all that well. But for what it is, it's a handy solution to accessing all your devices at once.

David Hollingworth

OVERALL



BUDGET SKYLAKE BOARDS



BENNETT RING EXAMINES THE VALUE AND PERFORMANCE TO BE HAD WITH BUDGET SKYLAKE MOTHERBOARDS

A couple of issues ago we took a look at the high-end motherboards designed to house Intel's new 6th Generation Core CPU, formerly codenamed Skylake. With an average price of well over \$300, these premium performance motherboards all used the zippy Z170 chipset as their basis. Z170 is the most expensive chipset built for Skylake, and at the time of Skylake's launch appeared to be the only chipset available. Fast forward a couple of months and this issue it's time to check out the more affordable options for Skylake, examining eight new motherboards based on the B150 and H170 chipsets from Intel. Starting as low as \$139, they're a much more wallet-friendly proposition, but what will you have to sacrifice in the move to a cheaper platform?

BUSINESS BOARDS FOR CONSUMERS

When we invited the major motherboard companies to this roundup, we didn't specify which chipset to send. Instead we asked them to aim for a price point of \$150, with \$200 as a ceiling, and expected to see a glut of H170-based boards. To our surprise, the vast majority of motherboards we were sent were based around the B150 chipset, which is meant to be targeted at businesses. It differs from Z170 in several ways.

For starters, forget about running twin Nvidia graphics cards. There's only one PCIe 3.0 lane with x16 bandwidth, and

it can't be divided over a second and third lane like Z170 boards. Thankfully AMD Crossfire users can still run multiple GPUs, as AMD doesn't require a minimum of PCIe 3.0 x8 to support Crossfire.

One of the best features of the Z170 chipset was the huge increase in number of high speed peripheral connections. This was thanks to the 26 Flex-IO ports connected to the new PCH chip (similar to ye olde Southbridge back in the day), and each port could be used for a variety of

"What will you have to sacrifice in the move to a cheaper platform?"

purposes: USB ports, PCIe lanes, Ethernet ports and more. This resulted in the claim that up to 20 PCIe 3.0 lanes can run on Z170. B150 isn't quite as generous in its provisioning of Flex-IO ports, with a total of 18, and Intel only promises a maximum of eight PCIe 3.0 lanes.

The total number of USB ports has also decreased. B150 delivers up to six USB 3.0 ports (Z170 could handle ten), while twelve USB 2.0 ports is the maximum (fourteen on Z170). While the number of SATA 3 ports remains identical, at six, B150 drops any and all support for RAID. Finally, there's also no support for overclocking, with Z170 still the only board that "officially" supports overclocking. This is a real shame for gamers, as the combination of a B150

board with Intel's i5 6600K could deliver a powerful platform on an extremely tight budget, but it's not to be. In the past we've seen motherboard makers enable overclocking on chipsets that shouldn't support it, but it appears this generation is a different story, with the Z170 remaining the only overclocking option.

HOW WE TESTED

We used Intel's new i7-6700K CPU in all of the boards, to ensure the results could be compared with our Z170 tests, along with twin sticks of Crucial's Ballistix Elite DDR4 memory (15-15-15 at 2133MHz). Once again Corsair's trusty H80i All-in-One cooler handled heat duties, while a Corsair Neutron XT SSD hosted a fresh install of Windows 8.1 64-bit edition. We used onboard graphics for all tests, while a Corsair RM850i PSU delivered power to the system. If you compare this issue's tests with the Z170 roundup, you'll notice a huge leap in 3DMark performance – this is due to a new Intel Graphics driver that was released recently.

To test each board we used benchmarks that focus on chipset performance. SiSoft's memory benchmark is perfect for testing the memory bandwidth, while the Cinebench and 7zip benchmarks both focus on overall CPU/chipset performance. Finally we ran 3DMark's Ice Storm Extreme test – this low resolution test places the emphasis on the CPU, RAM and motherboard, rather than the GPU.

ASRock B150 Gaming K4

LACKING SKYLAKE'S BEST FEATURE: HIGH SPEED STORAGE

We imagined we'd be seeing a lot of the H170 chipset when it came to budget gaming boards, but it appears that our price constraints were a tad tight. Skylake has arrived with a double whammy of pricing pressure that makes its boards expensive; pricey chipsets and a weak Aussie dollar. As a result we end up with products like this, a gaming board built around a chipset aimed at businesses.

Given the use of the B150 chipset, we were pleasantly surprised when performance of these boards averaged less than 10% slower than the far more expensive Z170 motherboards. Unfortunately this ASRock board trailed the pack in most of these tests, relying on features instead to appeal to buyers.

Twin full-length x16 PCIe 3.0 lanes



are present, along with three PCIe 3.0 x1 slots. As such, it'll handle CrossFire, but not SLI. Six SATA 3 ports are standard for B150, while Killer's new E2400 chipset handles the single Gigabit Ethernet port. At this price we're surprised there's no M.2 slot, nor any SATAe connectivity, which appears on other boards in the roundup. What it does have is 10 phase power, but the lack of overclocking support makes this a bit of a moot point. Even the memory speed is locked in at default, with the four DDR4 slots maxed out at just 2133MHz. At this speed DDR3 is actually faster, making this a bit of a pointless memory upgrade.

ASRock has rolled out its Purity Sound 3 solution, as found on their more expensive gaming boards. Based on the Realtek ALC1150 codec, ASRock has added higher-quality capacitors and amplifiers to deliver audio quality that rivals a dedicated sound card. This makes it a decent candidate as a gaming backbone. Despite looking the goods,



with plenty of chunky heatsinks and the slick design, we're a little underwhelmed by the B150 Gaming K4 from ASRock. We love the quality audio, but the rest of the board seems very middle-of-the-road, especially when it comes to the lack of M.2 or SATAe connectivity.

KEY SPECS

\$175 • www.asrock.com

2 x PCIe 3.0 x16 • 3 x PCIe 3.0 x1 • 6 x SATA 3 • DDR4 2133MHz • Fatality Mouse Port • Killer e2400 LAN

OVERALL



ASRock B150M Pro4

THE FIRST OF MANY MICRO-ATX BOARDS

Due to the sickly Aussie dollar, importing motherboards from Taiwan and China has become a whole lot more expensive of late. No wonder then that we received more Micro-ATX boards than we expected. At half the size of a standard ATX board, they're much cheaper to produce, and the result are affordable motherboards like this \$139 variant from ASRock.

Obviously it's not going to have as many PCIe slots as a full-sized board, with just two PCIe 3.0 x16 lanes and another two x1 lanes. Of the two full length x16 slots, only the first runs at x16 speed, with the second limited to x4 speed, which is a restraint of the B150 chipset.

Like many Skylake boards, ASRock has opted to cover the I/O backplate with a metallic shell for protection. We're not sure it actually does anything but gather dust and get in the way. Very basic

heatsinks cool the PCH and B150 chipset. ASRock has included three video outputs on this board, covering each of the major standards – D-Sub, DVI-D and HDMI 1.4. Sadly none of these is good for 4K at 60Hz, though HDMI 1.4 can do it at 24Hz.

As expected given the price, drive connectivity is limited to the six SATA 3 ports delivered by the B150 chipset. However, we're very happy to see Intel's very own I219V LAN controller delivering network connectivity, as we thought Killer's cheaper chip would surely be used. Onboard audio has been dumbed down to use Realtek's older ALC892 chipset, and it hasn't been touched up much via the use of additional components. We noticed an audible hiss when using it, which isn't surprising. There's also no optical out, which could be a show-stopper for some.

Four USB 3.0 ports face the rear of the board, with the option to connect and additional two USB 2.0 or two more USB 3.0 ports. However, ASRock doesn't include the extension panel with these ports, so you'll need to either buy it or



ensure they come with your chosen case.

Despite its rather mixed performance results, the price on this is right. We especially like the extra video outputs, yet overall it doesn't quite match Gigabyte's m-ATX board when it comes to added goodies.

KEY SPECS

\$139 • www.asrock.com

1 x PCIe x16 • 2 x PCIe 3.0 x1 • 6 x SATA 3 • DDR4 2133MHz, Realtek RTL8111H LAN

OVERALL



Asus H170 Pro Gaming

GAMING GREATNESS ON THE CHEAP

Asus appears to have rather expensive Skylake boards at the moment, as the company struggled to supply us with products below the \$200 mark. As a result, we let them stretch the price barrier a little with this gaming board, which costs around \$220 on average at the time of print. Let's see what that extra \$20 gets you.

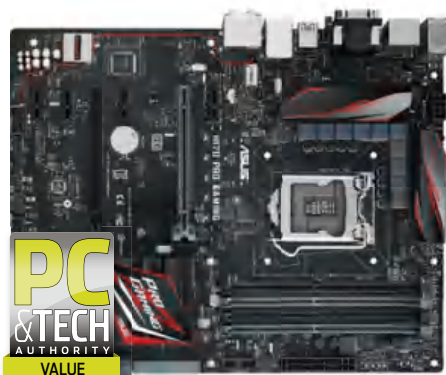
This full-sized ATX board looks the goods, with solid heatsinks surrounding the CPU socket and covering the PCH. Twin full-length PCIe x16 slots can accept two AMD GPUs, though once again SLI isn't an option thanks to the x4 speed of the second slot. Another four PCIe 3.0 x1 slots round out your peripheral options.

As the name suggests, this is the only H170 board in the roundup. This delivers more Flex-IO lanes than the B150, which in turn supports higher-speed connections

such as the twin connections available for your high-speed storage. The first is an Ultra M.2 port, the second a SATAe connection. We should point out that the twin SATA ports used to power the SATAe connection take out two of the six SATA 3 ports that the H170 chipset delivers.

A whopping four different video outputs are present – HDMI 1.4, VGA, DVI-D and DisplayPort. The inclusion of DisplayPort makes this the only product that can handle 4K at 60Hz, which could come in handy when watching high frame-rate movies such as *The Hobbit*, when and if the 4K Blu-ray standard ever releases.

It's also the only motherboard to include a USB 3.1 with Type-C port, alongside another 3.1, two 3.0 and two 2.0 ports at the rear of the board. This is thanks to the use of an ASMedia USB 3.1 controller. Four more 3.0 and six more 2.0 are supported via internal headers. Audio is a step above the rest, using Asus' SupremeFX audio solution. This is based around a Realtek ALC1150 audio chip, but has been beefed up with high-end amplifiers, capacitors



and shielding. We gave it a good listen and were very impressed.

It may cost \$30 more than competing boards, but it's an easy price jump to justify. Packing all of the latest technologies, there really isn't another gaming board so affordable yet so feature-rich. Highly recommended.

KEY SPECS

\$219 • www.asus.com.au

H170 chipset • 2 x PCIe 3.0 x16 • 4 x PCIe 3.0 x1 • 6 x SATA 3 • 1 x Ultra M.2 • 1 x SATAe • 4 x DDR4 2133MHz • Intel I219V LAN controller

OVERALL



Asus B150 Pro Gaming D3

CAN DDR3 KEEP UP WITH THE LATEST MEMORY TECHNOLOGY?

Skylake's ability to run both DDR3 and DDR4 memory is one of its more unique features, though Intel would definitely prefer users to make the move to the newer memory type. Asus was brave enough to send us the only board in the roundup to support DDR3 memory, but before you go reaching for your old DDR3 memory kit, we should probably point out one major issue with Skylake's support for it.

Skylake can't run the regular variety DDR3 that most of us have in our existing systems. Instead it needs DDR3L, the low-voltage version of DDR3 that runs at a mere 1.35V. Plug in 1.5V DDR3 and there's a high risk that you'll fry your new Skylake CPU. Then there's the issue of performance...

As our benchmarks show, DDR3 just can't keep up with DDR4 when it comes to raw bandwidth, as illustrated in the

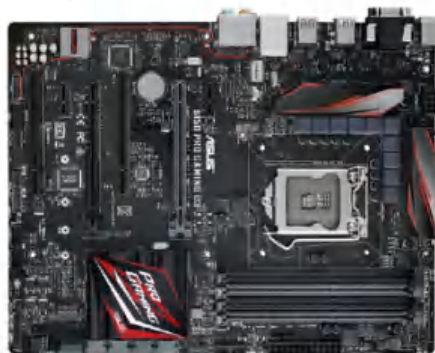
SiSoft Sandra memory benchmark. This in turn led to the lowest performance in both the 7zip and 3DMark benchmarks, with the latter over 10% slower than other boards. DDR3-powered boards might be convenient if you already own DDR3L, but they come with a performance penalty.

Thankfully for Asus, the usual extras present and accounted for on this board. A single M.2 slot is ready for your high-speed storage, while two USB 3.1 ports deliver speedy external connectivity, one of which is the newer Type-C variety.

The onboard audio is excellent at this price point, while Intel's quality I219V Gigabit Ethernet controller is appreciated. Finally, the range of PCIe slots is bang on, with two PCIe x16, another two PCIe x1 and two PCI slots.

Unfortunately it doesn't have quite as many video outputs as its slightly more expensive brethren, with just a single HDMI and VGA out.

At under \$200, this is a well-priced board, but the performance issues DDR3 brings to the table makes it hard to recommend. If you already own



low-voltage DDR3L memory and don't mind a 10% performance drop in games this board offers a very cheap Skylake upgrade option, but most users will find better options for a similar price, such as the stellar Asus H170 Pro Gaming.

KEY SPECS

\$195 • www.asus.com.au

B150 chipset • 2 x PCIe 3.0 x16 • 2 x PCIe 3.0 x1 • 2 x PCI • 8 x SATA 3 • 1 x Ultra M.2 • 4 x DDR3 1866MHz, Intel I219V LAN controller

OVERALL



Gigabyte G1.Sniper B7

THIS SHOOTER AIMS CLOSE, BUT JUST MISSES ITS MARK

At just ten bucks less than the Asus H170 Pro Gaming, the Gigabyte G1.Sniper B7 has its work cut out for it. The Asus gaming board is a very tough act to follow, especially when we see that Gigabyte's competing product is based on the more affordable B150 chipset. Thankfully Gigabyte has managed to pull out all the stops to deliver a board that comes very close to the Asus.

The G1.Sniper B7 definitely has a gaming focus, as evidenced by the Heroes of the Storm artwork on the box (apparently Gigabyte supplied the motherboards for BlizzCon). It's got the same striking green and black design of older Sniper boards. An interesting collection of PCI technologies deliver space for add-in cards; twin PCIe x16 slots, twin PCIe x1 slots, and twin legacy PCI slots. Once again Gigabyte throws in



support for the older PCI slots – perhaps their internal market research suggests this format is much more popular than we'd assumed?

Gigabyte has delivered Ultra M.2 and SATAe connections for high-speed drives, despite the B150 chipset's lack of Flex-IO ports compared to the H170. Unfortunately there's no USB 3.1 connectivity though, instead shipping with four USB 3.0 and one USB 2.0 ports on the rear I/O plate, with the option for 2 more 3.0 and four more 2.0 via internal headers.

Gigabyte's audio solution is a good match for Asus, and uses the same Realtek ALC1150, along with the usual high-end enhancements. Unique to Gigabyte though is the upgradeable OP-AMP, allowing the user to tailor the sound to their tastes. There's also a special set of switches that provide additional gain boost for high impedance devices.

Intel provides the chip for the onboard Gigabit LAN, while just two video outputs



are provided, HDMI 1.4 and DVI-D. In this regard the ASUS board is the clear winner, with its DisplayPort output giving it the 4K edge.

Still, the Gigabyte comes mighty close. It's got most, if not all of the same features, yet for just a tenner more the Asus is the one to buy thanks to its USB 3.1 and DisplayPort options.

KEY SPECS

\$210 • www.gigabyte.com.au

2 x PCIe x16 • 2 x PCIe x1 • 2 x PCI • 1 x Ultra M.2 • 1 x SATAe, 4 x DDR4 2133MHz • Intel I219V LAN controller

OVERALL



Gigabyte B150M-D3H

SMALL ON PRICE, BIG ON FEATURES

The second of three identically priced Micro-ATX motherboards to hit our roundup, Gigabyte's B150M-D3H claims to be the most durable of the lot, with the Gigabyte Ultra Durable branding splashed all over the box. However, it's also the most feature-rich board of the three, which is why we're giving it such a solid score.

We certainly didn't expect to see an M.2 port on this board, so were pleasantly surprised when Gigabyte included one. Even better, there's also a SATAe port if you prefer that variety, and it doesn't even cannibalise the existing six SATA 3 ports, unlike most affordable mobos. Four memory slots are included, twice that of the MSI m-ATX board, while CrossFire is supported thanks to the twin PCIe 3.0 x16 slots. Only one runs at x16 speeds though, with the other at x4 speed. Interestingly Gigabyte has chosen to round out



connectivity with two more PCI slots; we're not sure using legacy ports is such a good idea, and would have preferred to see PCIe x1 instead.

Heading to the I/O plate reveals four USB 3.0 and twin USB 2.0 ports, with the option for two more 3.0 and four more 2.0 ports delivered via internal headers. Three separate video outputs are featured, using DVI-D, VGA and HDMI 1.4 (supporting 4K at 24Hz). Audio outputs are also generous, with six 3.5 stereo minijacks, one of which doubles as S/PDIF for those who require optical out. Obviously the audio chipset powering these isn't going to be amazing at this price, with Realtek's ALC892 handling the processing. Gigabyte has stuck with an Intel LAN controller, though they don't mention which one it is.

We were surprised to see Gigabyte's DualBIOS technology on this board, which provides a backup BIOS in case the primary BIOS gets corrupted. In fact, this board came with many surprises, and it's well ahead of the competition when it comes to features.



Combine all the extra goodies with respectable performance figures, and this is a no-brainer of a purchasing decision. For a Skylake m-ATX board on a budget, nothing comes close to this board, though be aware that half of its peripheral slots are of the older PCI variety.

KEY SPECS

\$139 • www.gigabyte.com.au

2 x PCIe 3.0 x16 • 2 x PCI; 6 x SATA 3 • 1 x Ultra M.2 • 1 x SATAe • 4 x DDR4 2133MHz • Intel Gigabit LAN controller

OVERALL



MSI B150 Gaming M3

ANOTHER GAMER WHICH DOESN'T QUITE MAKE IT

Our final gaming board is the most affordable of the three, although it's by the slimmest of margins when compared to the DDR3-powered Asus. At \$30 less expensive than the excellent Asus H170 Pro Gaming board that we love so much, MSI has to deliver a rather exceptional product to stay in the running.

Like Gigabyte, MSI has gone with a broad mix of slots for peripherals. Two each of the PCIe x16 and PCIe x1 type cater for your modern products, while three more legacy PCI slots will handle your old SoundBlaster or video capture cards. Unfortunately MSI is the only company to go for a Killer network solution, Killer's E2400 chipset. We've had issues with the Killer software numerous times in the past, so always recommend Intel's more reliable solution.



Thankfully it's now possible to run the Killer LAN without the bloatware, which keeps performance high, but negates all of the QoS benefits.

Thankfully the audio solution is a potent match for the other boards. Audio Boost 3 is built around a Realtek ALC1150 with high-end components, and our testing put it on par with both the Gigabyte and ASUS gaming boards. One unique feature is the inclusion of Nahimic surround, which offers decent headphone virtual surround sound. Five stereo minijacks are perfect for hooking up to older sound systems, while a single S/PDIF delivers optical out. In terms of onboard USB ports, this board has the most we've seen, with four USB 2.0 and four USB 3.1 on the I/O plate already, with room for another two 3.1 and two 2.0 via headers.

Ultra M.2 and SATAe are both included, while a single DVI-D and HDMI out deliver video out. As you can see, this board is a very close match to Gigabyte's G1.Sniper



B7, but with a \$20 cost saving. To be frank, we think they're both equally good, if not quite as great as the Asus.

KEY SPECS

\$189 • www.msi.com

2 x PCIe x16 • 2 x PCIe x1 • 3 x PCI • 1 x Ultra M.2 • 1 x SATAe, 4 x DDR4 2133MHz, Killer e2400 LAN controller

OVERALL



MSI B150M PRO-VD

FALLING SHORT

The third of our Micro-ATX motherboards, the MSI B150M Pro-VD finds itself in cluttered waters. What has MSI delivered to make its mini-board worthy of mention?

To put it bluntly, nothing. Just one PCIe 3.0 x16 slot is included, down from two on competitors. Twin PCIe 3.0 x1 slots sit just below it, and these in turn sit above the four main SATA 3 ports. Another two SATA 3 ports at the right edge of the board bring the total to six, the number supported by the B150.

Given the preponderance of HDMI these days, its absence on this product is baffling. We can't remember the last time we had to test with a DVI-D cable, though there's also the option of VGA if you want to go really old school. As a result, the maximum supported resolution using onboard video is just 1900 x 1200 at 60Hz, over the DVI-D port (VGA supports 2048



x 1536, but only at 50Hz).

Even the number of audio outputs is tiny, with just three 3.5mm stereo minijacks piping out the audio from the Realtek ALC887 codec. However, it's possible to power a 7.1 system when these three are used in conjunction with the front audio panel on your case, though we'd highly recommend against – this audio chipset simply isn't worthy a 7.1 sound system. Realtek has also been put to use in the LAN controller, which uses a RTL8111H Gigabit Lan controller.

Four USB 3.1 ports adorn the rear, while another two can be delivered via the internal header. Another four USB 2.0 ports can be attached via internal headers, provided you've got the right extension in your case. One unique feature of this board is the inclusion of three tiny LED lights that glow if something goes amiss with the CPU, Memory or VGA.

Sadly that one feature alone isn't enough to propel this motherboard into the limelight. There's also the fact that it's \$20 cheaper than the other mini



motherboards, yet they're still better options that deliver more bang for your Micro-ATX buck.

KEY SPECS

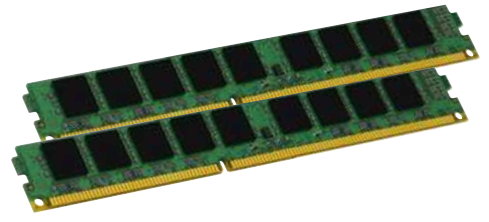
\$115 • www.msi.com

1 x PCIe x16 • 2 x PCIe 3.0 x1 • 6 x SATA 3 • DDR4 2133MHz, Realtek RTL8111H LAN

OVERALL



Kingston comes to the rescue



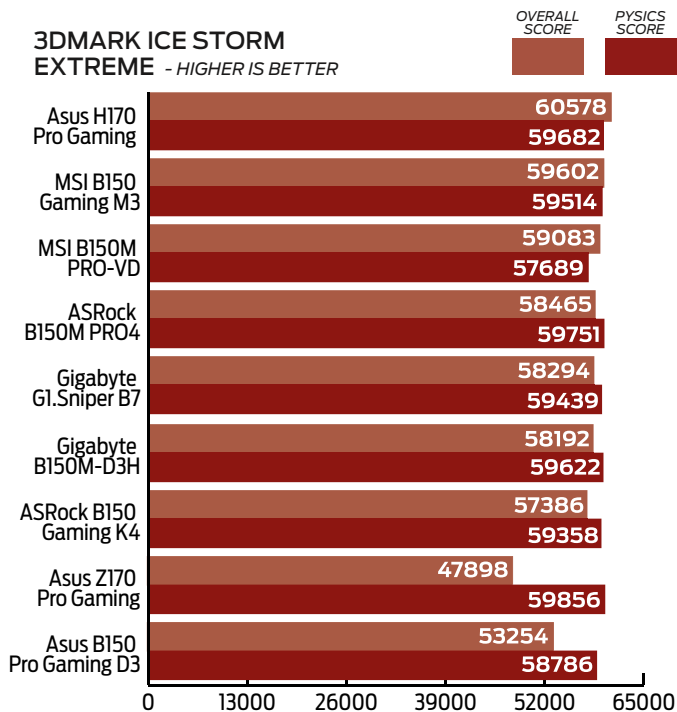
While much ado has been made about Skylake's support for DDR4 memory, it can also run DDR3 memory. This sounds like a massive win for those upgrading from older systems, who are already running oodles of DDR3 thanks to its incredibly cheap pricing. However, as we soon discovered, Skylake won't play with any old DDR3 memory – it likes the low-

voltage variety.

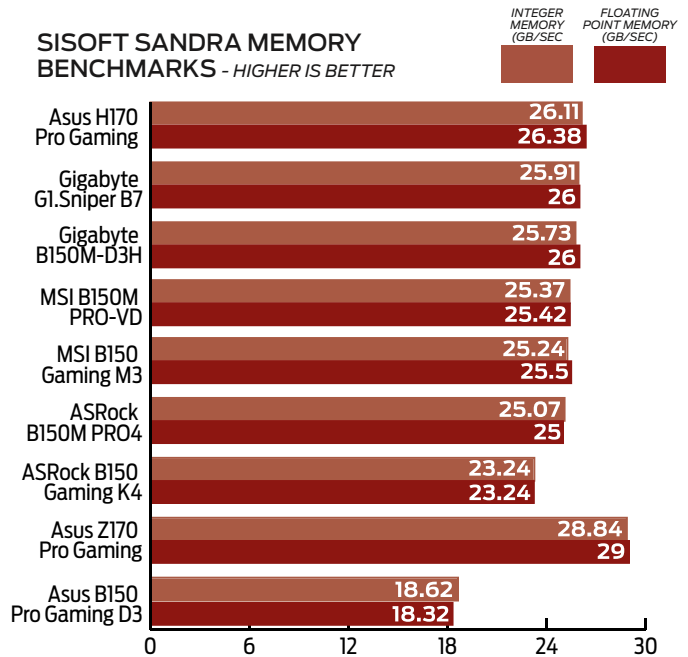
Plugging in standard 1.5V memory saw our single DDR3-powered board fail to boot, and it was only then that we discovered the platform's requirement for DDR3L, which runs at 1.35V. Cue several urgent calls to Kingston, who delivered twin sticks of the low voltage memory. The motherboard ran perfectly

with the new 1.35V memory, and we later read that running 1.5V memory can even fry Skylake processors. And as you'll see from our Asus B150 Pro Gaming D3 review, pairing Skylake with DDR3L also drags performance down.

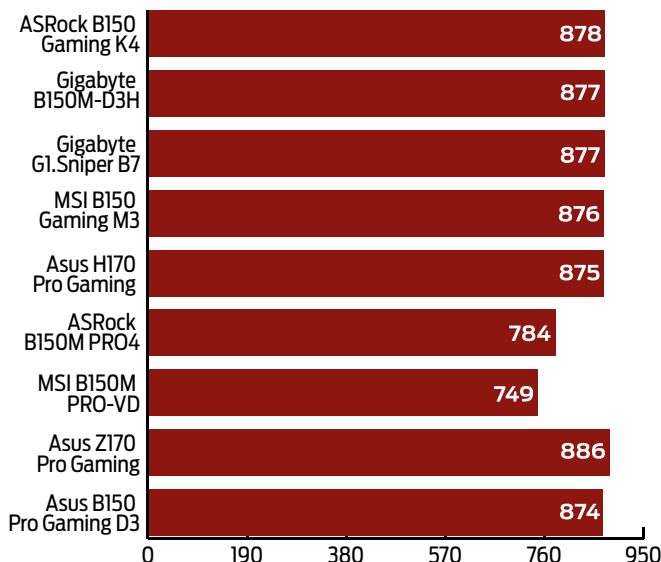
3DMARK ICE STORM EXTREME - HIGHER IS BETTER



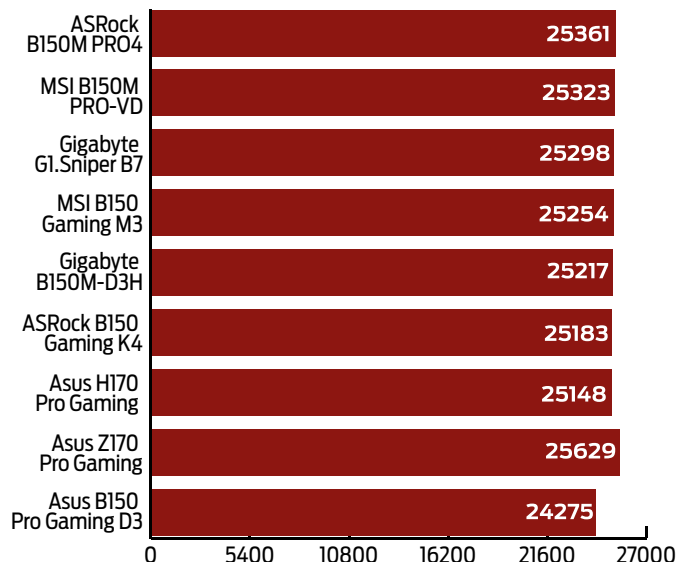
SISOFT SANDRA MEMORY BENCHMARKS - HIGHER IS BETTER



CINEBENCH R15 CPU BENCHMARK - HIGHER IS BETTER



7ZIP BENCHMARK - HIGHER IS BETTER TOTAL RATING (MIPS)



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Buyer's guide

THE LAPTOP MARKET HAS BECOME INCREDIBLY COMPETITIVE, WITH PRICES FOR DECENT MACHINES FALLING TO ALL-TIME LOWS. HERE'S WHAT YOU SHOULD BE LOOKING FOR

Windows 10 is a second chance – it's a second chance for consumers saddled with Windows 8 to upgrade to an operating system that properly understands the difference between laptops and tablets, and yet serves both equally well. Furthermore, it's a second opportunity for the laptop manufacturers to prove that their impressive 360-degree hinges, touchscreens and tablet docking systems aren't pointless novelties.

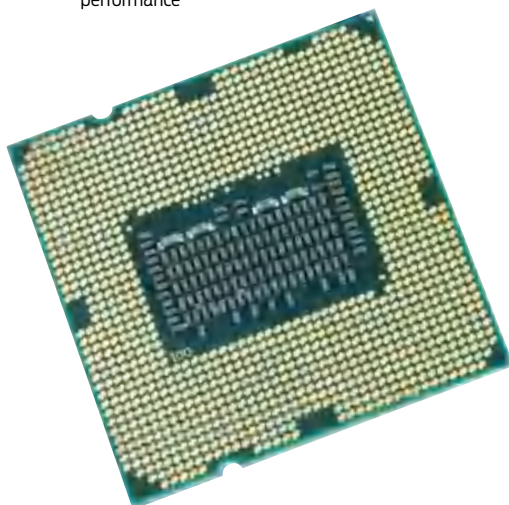
Eight laptops that show off Windows 10's versatility are on test here. Our lineup includes the most novel, yet budget-friendly, one-size-fits-all hybrids, as well as more conventional laptops for traditionalists who want a device for work as much as mindless consumption.

The number of manufacturers has dwindled, leaving a small field of extremely powerful brands with a huge roster of laptops to sell. This process has made the market staggeringly competitive, with prices for competent laptops dropping to all-time lows. We're almost at a point where there are no "bad" laptops.

Almost. You can still bag a turkey, especially if you misjudge what you need from your laptop. The processor will have the biggest impact on what you can get done. More cores don't necessarily equate to better performance – for example, a quad-core Intel Atom processor is no match for a dual-core Intel Core i5.

If you're looking for snappy performance, an Intel Core i5 or i7

✓ The Intel Core i7 is the best processor for snappy performance



"Look out for dual-core Celerons and quad-core Atoms if you want the best battery life, but be prepared to sacrifice performance"

processor is the way to go, but with great power comes compromise. These chips are comparatively power-hungry and generate plenty of heat, so aren't always the best choice if you're often on the move without mains electricity. Look for dual-core Celerons and quad-core Atoms if you want the best battery life, but be prepared to sacrifice speed.

The most powerful laptops on test here also come with dedicated graphics chips. Most GPUs now save as much power as possible, but their presence when watching HD videos and playing games will, again, increase power consumption.

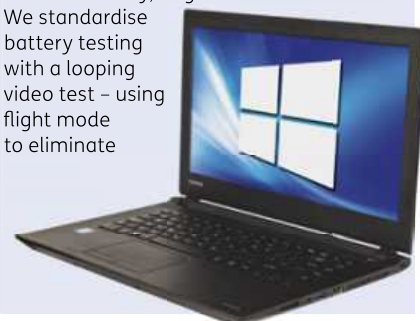
Don't scrimp on the display, either. It's impossible to buy a laptop with a screen resolution lower than 1,366 x 768 these days, and this resolution actually works very well on smaller laptops, keeping the text legible without having to resort to awkward magnification. Larger laptops generally boast Full HD (1,920 x 1,080) panels, which are big enough to put

^ The most powerful laptops here come with dedicated graphics chips

windows side by side for multitasking. Full HD doesn't necessarily mean great image quality, though. Many HD panels sacrifice colour accuracy and vibrancy to cut costs.

HOW WE TEST

PC & tech Authority's quantitative benchmarks complement our hands-on testing. We test performance using a set of multimedia benchmarks, producing an overall score for photo processing, video rendering and multitasking. For reference, a desktop PC with an Intel Core i5-4670K with 8GB of RAM scores 100 in each test. We analyse screen performance with an X-Rite i1Display Pro calibrator, measuring colour accuracy, brightness and contrast. We standardise battery testing with a looping video test – using flight mode to eliminate



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- ✓ Two USB ports for 3G/4G USB modems, network printer, storage and USB thermometer
- ✓ Integrated IEEE 802.11ac wireless Access Point; dual band; up to 1300Mbps throughput
- ✓ VoIP (2 x FXS and 1 x FXO Line Port) for Vigor2860Vac

Vigor2925ac / Vigor2925Vac Dual Gigabit WAN Broadband Router

- ✓ Multi-WAN with dual Gigabit Ethernet WAN and USB ports for 3G/4G dongles
- ✓ Five Gigabit LAN ports with multiple subnets and 50,000 NAT sessions
- ✓ Two USB ports for 3G/4G USB modems, network printer, storage and USB thermometer
- ✓ Integrated IEEE 802.11ac wireless Access Point; dual band; up to 1300Mbps throughput
- ✓ VoIP (2 x FXS and 1 x FXO Line Port) for Vigor2925Vac



NBN Ready



UFB Ready

2x

VPN

Vigor2132ac Gigabit WAN Broadband Router

- ✓ Integrated IEEE 802.11ac wireless Access Point; dual band; up to 1300Mbps throughput
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- ✓ 4 x Gigabit Ethernet LAN ports with 30,000 NAT sessions
- ✓ 2 x USB ports for USB printer, storage and USB thermometer



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				LABS WINNER	
	Acer Aspire R 11 (R3-131T)	Asus N551JX	Asus Transformer Book T100 Chi	Dell Inspiron 15 5558	
OVERALL RATING	★★★★☆	★★★★☆	★★★★☆	★★★★☆	
PURCHASE INFORMATION					
Price	\$699	\$1449	\$589	\$830	
Dimensions (WDH)	298 x 211 x 21mm	383 x 225 x 32mm	365 x 175 x 15mm	380 x 260 x 24mm	
Weight (with charger)	1.6kg (1.8kg)	2.7kg (3.2kg)	1.1kg (1.2kg)	2.5kg (2.8kg)	
SERVICE & SUPPORT					
Warranty	1yr RTB	2yr RTB	2yr RTB	1yr C&R	
CORE COMPONENTS					
Processor	Dual-core 1.6GHz Intel Celeron N3050	Dual-core 2.8GHz Intel Core i5-4200H	Quad-core 1.46GHz Intel Atom Z3775	Dual-core 2.2GHz Intel Core i5-5200U	
RAM fitted	2GB	8GB	2GB	8GB	
DISPLAY					
Size & finish	11.1in gloss	15.6in matte	10.1in gloss	15.6in matte	
Resolution	1,366 x 768	1,920 x 1,080	1,920 x 1,200	1,920 x 1,080	
Touchscreen (type)	Capacitive	✗	Capacitive	✗	
Graphics chipset	Intel HD Graphics	Nvidia GeForce GTX 950M	Intel HD Graphics	Nvidia GeForce GTX 920M	
Video outputs	HDMI	HDMI; mini-DisplayPort	micro-HDMI	HDMI	
DRIVES					
Storage capacity	500GB	128GB + 1TB	64GB	1TB	
Storage type	Hard disk	SSD + hard disk	eMMC flash	Hard disk	
Optical drive	✗	DVD/RW	✗	DVD/RW	
BATTERY					
Type (capacity)	Lithium polymer (3,270mAh)	Lithium polymer (56Wh)	Lithium polymer (3,950mAh)	Lithium ion (40Wh)	
PORTS & CONNECTIONS					
Wireless connectivity	802.11n; Bluetooth 4	802.11ac; Bluetooth 4	802.11n; Bluetooth 4	802.11ac; Bluetooth 4	
Wired Ethernet speed (Mbps/sec)	10/100/1,000	10/100/1,000	✗	10/100/1,000	
Memory card reader	SD	SD/SDHC/SDXC	microSD	SD/SDHC/SDXC	
Ports	3.5mm headphone jack; USB 3; USB 2	3.5mm headphone jack; 3 x USB 3	3.5mm headphone jack; USB Micro-B	3.5mm headphone jack; 3 x USB 3	
OTHER FEATURES					
Webcam	✓	✓	✓	✓	
Backlit keyboard	✗	✓	✗	✗	
Touchpad toggle on/off	✓	✓	✓	✓	
Volume control	✓	✓	✓	✓	
SOFTWARE					
Operating system	Windows 8.1 (free Windows 10 upgrade)	Windows 8.1 (free Windows 10 upgrade)	Windows 8.1 (free Windows 10 upgrade)	Windows 8.1 (free Windows 10 upgrade)	

	RECOMMENDED			
	HP Envy x360	HP Pavilion x2	Lenovo Yoga 3	Toshiba Satellite Radius 15
	★★★★☆	★★★★☆	★★★★☆	★★★★☆
	\$TBA	\$499	\$1899	\$TBA
	382 x 250 x 24mm	264 x 173 x 20mm	335 x 230 x 18mm	380 x 245 x 20mm
	2.3kg (2.5kg)	1.2kg (1.4kg)	1.7kg (1.9kg)	2.3kg (2.5kg)
	1yr C&R	1yr C&R	1yr RTB	1yr RTB
	Dual-core 2.2GHz Intel Core i5-5200U	Quad-core 1.33GHz Intel Atom Z3736F	Dual-core 2.4GHz Intel Core i7-5500U	Dual-core 2.2GHz Intel Core i5-5200U
	8GB	2GB	8GB	8GB
	15.6in gloss	10.1in gloss	14in gloss	15.6in gloss
	1,920 x 1,080	1,200 x 800	1,920 x 1,080	1,920 x 1,080
	Capacitive	Capacitive	Capacitive	Capacitive
	Intel HD Graphics 5500	Intel HD Graphics	Intel HD Graphics 5500	Intel HD Graphics 5500
	HDMI	micro-HDMI	HDMI	HDMI
	1TB	32GB	256GB	1TB
	Hard disk	eMMC	SSD	Hard disk
	✗	✗	✗	✗
	Lithium ion (43Wh)	Lithium ion (28Wh)	Lithium ion (45Wh)	Lithium ion (45Wh)
	802.11ac; Bluetooth 4	802.11n; Bluetooth 4	802.11ac; Bluetooth 4	802.11ac; Bluetooth 4
	10/100/1,000	✗	✗	✗
	SD/SDHC/SDXC	microSD	MMC/SD/SDHC/SDXC	SD/SDHC
	3.5mm headphone jack; 2 x USB 3; USB 2	3.5mm headphone jack; USB 2	3.5mm headphone jack; USB 3; USB 2	3.5mm headphone jack; 2 x USB 3; USB 2
	✓	✓	✓	✓
	✓	✗	✓	✓
	✓	✓	✓	✓
	✓	✓	✓	✓
	Windows 8.1 (free Windows 10 upgrade)	Windows 8.1 (free Windows 10 upgrade)	Windows 8.1 (free Windows 10 upgrade)	Windows 8.1 (free Windows 10 upgrade)



A guide to upgrading from Windows 8.1 to Windows 10

UPGRADING TO WINDOWS 10 ISN'T AN ERROR-FREE PROCESS. WE TAKE YOU THROUGH THE KEY CHECKS AND TWEAKS YOU SHOULD MAKE ON YOUR NEW (OR OLD) LAPTOP

Even if you buy a new laptop now, you're not guaranteed to find Windows 10 preinstalled. Instead, you may get Windows 8.1 and find stickers on the box and the laptop itself telling you that you're entitled to a free upgrade.

The timing of Windows 10 was always going to be awkward for manufacturers, because Windows 10 was launched well after many of the bigger companies released their new laptop ranges. With the number of units sitting on container ships and in warehouses, it's impossible to upgrade those laptops already out in the wild, so they make it into consumers' hands without Windows 10.

You have until 29 July 2016 to upgrade your laptop to Windows 10 for free. After that point, you will have to pay the full retail price for Windows 10, which currently sits at around \$160 for the Home edition.

Around half of our review units came with Windows 10 already preinstalled, but this is because the companies in question manually upgraded them to Windows 10 before they were dispatched to us. The other half we upgraded ourselves. The exception here is PC Specialist, which supplies its Sigma laptop with Windows 10 straight out of the box.

✓ You will almost certainly need to upgrade from Windows 8.1



^ You can claim your free upgrade until 29 July 2016

READY, SET, START!

You can begin to prepare your new laptop for Windows 10 before it has even left the warehouse. Aside from backing up your files to an external hard disk, the cloud or a NAS, you can also prepare a USB flash drive with a Windows 10 installation.

This is something we'd highly recommend doing, as it will speed along the upgrade process when your new laptop does eventually arrive. Full instructions are available from tinyurl.com/qhmvsgl.

If you don't do the above, you can still undertake a fairly seamless upgrade when you first switch on your PC. As long as you've connected your laptop to an internet-connected network when you first switch on, you'll be given the option to upgrade immediately. This will add a lot of time to the installation process, as you'll first have to wait for a 2.7GB file download and then run a second installation process. If you've already prepared an upgrade USB drive, you can skip this and upgrade once you've made it to the Windows 8.1 desktop.

IN THE DRIVER'S SEAT

While our upgrades to Windows 10 went fairly smoothly, using the USB method outlined above, we did find one occasion where an out-of-date driver caused problems. You can read more about our touchpad dramas with the Acer Aspire R 11 on p70, but the lesson here is that even if your PC is apparently supported by the manufacturer, sometimes third-party drivers (in this case, Synaptics') aren't quite ready.

In more extreme cases, you may be missing a driver entirely. You can check whether crucial drivers are missing by heading to Device Manager, which you'll find in the context menu that appears when you right-click the Start button. Device Manager automatically shows (highlighted with a yellow triangle) hardware that it doesn't recognise or is missing a driver. Common culprits are wireless chips, touchpads and graphics.

Many of the big-name makers have bespoke update utilities. These are easy to ignore as they blend into the other bloatware they insist on installing, but this sort of software can be useful as it automatically locates and downloads the latest drivers for all the components in your PC. While you're going through programs and features, uninstalling unwanted software, be sure to leave



“There are teething problems to be dealt with and not every upgrade will go smoothly, but things are looking bright”

your manufacturer's update tool alone. If you don't have one, the manufacturer website should have download pages for all the drivers you might need.

QUICK FIXES

Aside from showstopping driver problems, there are other minor changes you'll want to make so that everything runs smoothly. One interesting side effect of Windows 10's new features is massively prolonged boot times on laptops that had Windows' "Fast Startup" setting enabled. We didn't find this affected our review laptops, although this might have something to do with the fact we didn't use them with Windows 8.1 and upgraded them immediately to Windows 10.

If you're subjected to a long black screen on startup but can still see your cursor and move it around, try switching off Fast Startup, which can be found in Advanced Power Settings | Choose What The Power Button Does. Then switch your laptop off and on again (fully power it off, do not simply restart) and, in most cases, the problem should be fixed. You can turn Fast Startup on again for

IS YOUR OLD LAPTOP READY FOR WINDOWS 10?

Newer laptops are always going to be better supported than older models, although if you're not yet prepared to ditch your current laptop, you should check the manufacturer's website to see if it's been tested for Windows 10. This is well worth doing; you'll no doubt know somebody who upgraded their ageing laptop to Windows 10 only to discover that everything from the touchpad to the wireless drivers was non-functional.

Dell has included a complete list of devices tested with Windows 10. It's not necessarily exhaustive, but the laptops that have definitely got the thumbs up are listed at tinyurl.com/nn7kjev. Lenovo has also drawn up a list of the devices that officially support Windows 10: tinyurl.com/qguxtpb

Acer's list tells you which devices are eligible for Windows 10, although it's worth nothing that Acer's model numbering and SKU system is very confusing, so not every device that's actually supported will be listed at tinyurl.com/ntajhno

Toshiba has a list of devices that, when updated with the latest drivers, are compatible with Windows 10: tinyurl.com/q3qylhj

Asus lets you enter your model number to see if it's compatible. Additionally, this page has a list of Asus-exclusive software that may require updating after the Windows 10 installation and various useful FAQs: tinyurl.com/pazg34t

HP also lets you enter your model number to check if it's compatible: tinyurl.com/ppzt5nk

quicker boot times in future.

You can also make privacy tweaks to stop Windows 10 from phoning home at every opportunity. Bear in mind that tinkering with privacy options will stop some Windows 10 features from working (such as Cortana, location and Wi-Fi Sense). However, if you want Windows 10 but don't want your data to be shipped off to Redmond you can switch it all off.

If you find that you still have a persistent and horrible driver issue or other intractable problem after installing Windows 10, you have a month to go

back to Windows 8.1 from the date of installation.

As our glowing five-star review of Windows 10 will attest, the new operating system is an upgrade in every sense of the word. Of course, there are teething troubles to be dealt with and not every upgrade will go smoothly. Once we've passed this awkward period of Windows 10 being an upgrade instead of coming as standard, though, things are looking bright.

✓ The new OS is an upgrade in every sense of the word





Dell Inspiron 15 5558

POOR BATTERY LIFE ASIDE, THE DELL INSPIRON 15 5558 IS A POWERFUL LAPTOP THAT'S UNBEATABLE VALUE FOR MONEY

So-called “do everything” laptops are getting cheaper with every innovation from component manufacturers such as Intel and Nvidia. Dell’s Inspiron line has long been a popular choice for those on a tight budget, and this 15.6in laptop is an easy sell when it comes to the important “bang for your buck” ratio.

Your \$830 buys you a dual-core (with Hyper-Threading) Intel Core i5 clocked to 2.2GHz, 8GB of RAM and Nvidia’s latest GeForce 920M graphics card. That substantial spec pushed the Inspiron 15 5558 to an overall score of 35 in our benchmarks, easing its way past the HP Envy x360 and Toshiba Satellite Radius 15, and coming second to the Asus N551JX.

The processor may only be a dual-core chip, but we never felt hamstrung by it – open as many browser tabs as you like and you’ll barely notice a stutter.

That said, if you choose to keep the preinstalled McAfee LiveSafe software, you’ll find the noise of your teeth grinding growing ever louder as it interferes with programs and runs scans willy-nilly. We

“If you’re mostly deskbound and want a laptop that will handle work, nothing beats the Inspiron 15 5558”

uninstalled it as soon as possible.

The GeForce 920M graphics card managed an average of 30.5fps in the Bioshock Infinite benchmark at Very Low settings and 1,920 x 1,080 resolution. You won’t be able to play the very latest games in Full HD, even at limited graphics settings, but this low-end chip at least

gives you the option to fire up a few older titles and play newer ones at a reduced resolution, which isn’t bad for an \$800 laptop.

Windows 10 (which is available as a free upgrade from the preinstalled Windows 8.1) feels responsive, and the only slight hesitancy in normal use comes from the spacious – if slightly sluggish – 1TB, 5,400rpm Toshiba hard disk.

BATTERY BURNOUT

With such a strong spec for the price, there are naturally compromises, the biggest of which is the battery. It recorded one of the worst results of the laptops on test, managing only 3hrs 12mins of our looping-video playback benchmark before shutting itself down. This means you never feel quite as free and off the grid as you might hope, making this laptop better suited to domestic use than life on the road.



“The Inspiron 15 5558 laptop is an easy sell when it comes to the important ‘bang for your buck’ ratio”

Indeed, this isn't a particularly portable laptop at 2.3kg and 24mm thick. You can slide it into a bag, but you'll definitely know it's there. The grey plastic shell lacks rivals' premium feel, and the textured lid feels rugged, even if its dappled effect divided opinion in the office. The keyboard is a shallow and harsh plastic affair, with no backlight and little in the way of tactile feedback. The touchpad is surprisingly good for the money, though, with Dell finally realising the importance of a pad and drivers that understand what you're trying to do.

Ergonomically, it doesn't have the class of the similarly specified Toshiba Satellite Radius 15, but you'll need to shell out an extra \$300 and do without dedicated graphics if you want Toshiba's premium build quality.

With a Full HD resolution spread across its 15.6in display, working with two windows side by side isn't only possible, but comfortable. It's not a touchscreen, and we occasionally found ourselves reaching out in vain, but what you get instead of a glossy, grease-smeared display is a matte-coated panel, which improves legibility of text and also keeps overhead lighting and sunlight from obscuring what's on screen.

BENCHMARKS

OVERALL

38

Breakdown scores

58

42

23



- 1 A Full HD resolution and 15.6in diagonal means this laptop is perfect for viewing two windows side by side
- 2 We're fond of the spacious touchpad, which we found extremely responsive in general use
- 3 The sides of the laptop host three USB 3 ports, a full-sized HDMI, 3.5mm headphone jack, SD reader and DVD drive— and tough

Colour accuracy is wayward – the screen can produce only 58% of the sRGB colour gamut, resulting in even the most vibrant colours looking a touch drab. Contrast is high and there's no problem with narrow viewing angles, although overall brightness is rather dim at 210cd/m2. However, as we've already established, this isn't a laptop for people who work outdoors.

Connectivity is well catered for, with three USB 3 ports, a full-sized HDMI, 3.5mm headphone jack, an SD card reader and a DVD drive all finding a place around the edges of the Inspiron 15 5558. The speakers, which are so often an afterthought on laptops with sliced budgets, offer well-balanced sound from both music and movies, with high-frequency dialogue and soundtrack perfectly audible. Even turned up to maximum volume, distortion is minimal. There is also the very welcome added bonus of dual-band 802.11ac Wi-Fi, ensuring that you'll get maximum speed from modern routers.

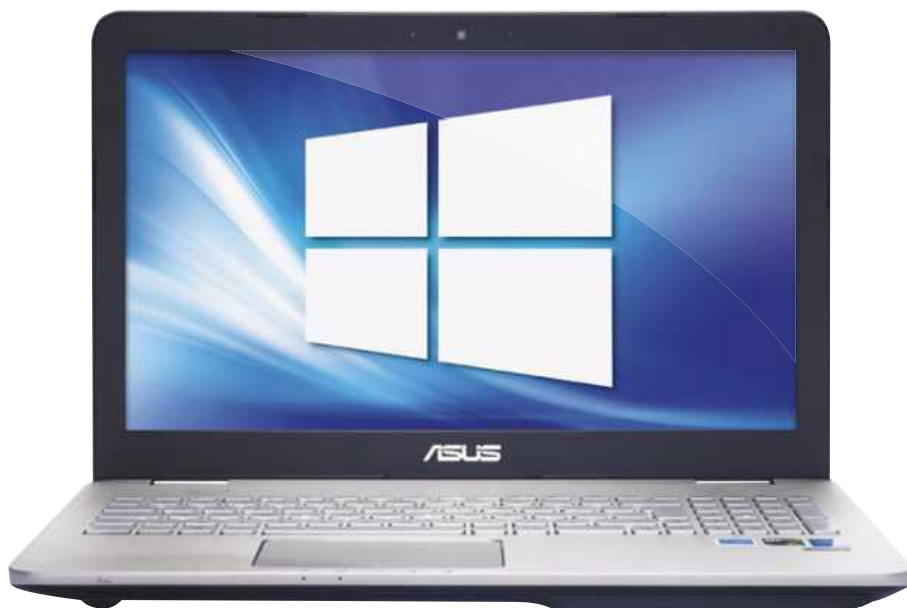
Overall, the Dell Inspiron 15 5558 is the best-value laptop on test here. It doesn't hit every note, and its battery life is particularly disappointing, but if you're mostly deskbound and want a laptop that will handle work, multimedia and web browsing, nothing will beat the Inspiron 15 5558.

KEY SPECS

\$830 • www.dell.com.au

OVERALL





Asus N551JX

GREAT DESIGN AND POWERFUL COMPONENTS, BUT THE SCREEN MARS AN OTHERWISE LABS-WINNING EFFORT

The Asus N551JX's powerful internals place it at the non-portable end of the spectrum. It's 32mm thick and weighs a wince-inducing 2.7kg, even without its large power adapter. You won't tip over backwards if you sling it into a backpack, but it will definitely alter your centre of gravity.

Despite its chunky characteristics, it's an attractive laptop with curved, swooping edges, a metal lid and a metallic keyboard tray with decorative circular patterns. You also get a dinky subwoofer to plug into the dedicated audio jack, which augments the otherwise unremarkable built-in speakers.

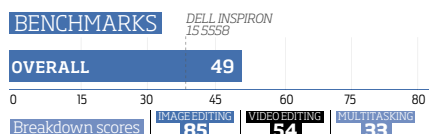
The backlit keyboard is satisfyingly chunky and offers plenty of tactile feedback, and includes a full number pad and set of function keys. The power button is integrated into the main keyboard, but it's harder to press than the character keys, so you're unlikely to hit it by accident, unless you're typing in a furious rage.

The fourth-generation dual-core Intel Core i5-4200H is a step up from devices with a U ("ultra low-power") suffix, with the H suffix denoting a chip with higher-

end graphics and a much higher TDP. Indeed, the chip in use here has a huge TDP of 47W and a base clock speed of 2.8GHz, which can Turbo Boost to 3.4GHz, easily beating laptops with Core i5-5200U chips. With an overall score of 49 in our benchmarks, including an impressive score of 85 in the single-core image-editing test, it thrashed the competition and underlined its credentials as a power user's plaything.

Gamers can get in on the action, too. The Nvidia GeForce GTX 950M is a mid-range mobile chip that's capable of playing the latest games at Full HD resolution, although you'll have to drop the graphical eye candy to achieve playable frame rates. Still it managed

✓ Despite its heft, this is a stylish, well-designed laptop



an average frame rate of 105fps in the Bioshock Infinite benchmark at Medium settings in Full HD.

Not only is the processing and graphics kit formidable, you also get 8GB of RAM and a 128GB Kingston SSD, which leaves Windows 10 (upgraded from Windows 8.1) feeling snappy when you're hunting down files using Cortana. There's also a 1TB mechanical hard disk on board for bulk file storage, giving this laptop the best of both worlds in performance and capacity.

Despite the high-end components, the chunky six-cell, 56Wh battery powered the laptop through 4hrs 54mins of our looping video playback test.

When you're getting so much for \$1449, you begin to wonder where Asus has cut costs. Sadly, the compromise is saved for the screen. The Full HD resolution is fine, but viewing angles are particularly poor and colour accuracy is among the worst of any laptop on test.

For only \$1449, the Asus N551JX is a fantastically powerful laptop with very few compromises, but if there's one compromise we never want to see on a laptop, it's the screen. What's even more galling is the fact that the displays were a strength of Asus's previous-generation N551 Series. Consequently, if you're looking for a laptop that's going to spend most of its time hooked to an external display, it's the pick of the crop. Otherwise, it falls tantalisingly short of greatness.

KEY SPECS
\$1449 • www.asus.com.au





BENCHMARKS

OVERALL 9



you can go an entire working day without having to attach the USB Type-C charger.

All the x2's ports are on the tablet portion – the keyboard doesn't offer any extra connectivity. Alongside the charger, there's a conventional USB 2 port, a microSD card slot for expanding the device's paltry 32GB of eMMC flash storage, as well as a 3.5mm headset jack. Despite the Bang & Olufsen speaker branding, there's no bass whatsoever and it doesn't even seem as if the audio is coming out of the front-facing grilles.

Performance is surprisingly sprightly. The quad-core processor does a decent job, but much of the credit should go to a combination of Windows 10's massively improved gestures and the clever rendering techniques of the Edge web browser. Load up The Guardian's image-heavy homepage using Google Chrome and you'll notice things slow to a judder as you attempt to scroll up and down. Edge capably handles what matters first, loading text and then images, while keeping the scrolling action smooth and predictable.

Our more challenging multimedia benchmarks don't paint such a pretty picture, with a deathly overall score of 9. It must be said, however, that an Intel Atom processor was never intended to render 4K videos.

The HP Pavilion x2 definitely lacks oomph, but it's one of the best budget hybrids you can buy today. Set aside the paltry storage and iffy speakers, and you have an effective laptop and a decent tablet, which is quite something for \$499.

KEY SPECS

\$499 • www.hp.com.au

OVERALL



HP Pavilion x2

AN ABSOLUTE BARGAIN FOR A COMPETENT TABLET AND A DECENT LAPTOP THAT COMBINE INTO A SINGLE DEVICE

In a group test surrounded by so many more expensive, higher-specification laptops, the HP Pavilion x2 looked to be an underdog. If it were still running Windows 8.1, this would certainly be the case.

However, with Windows 10 onboard, this sort of device is really starting to make sense, and while power users will scoff at the tiny 10.1in screen, 1.33GHz Intel Atom processor and 32GB of storage, there is now much to be said for these little hybrid devices.

It's cheap, but by no means nasty. To the naked eye, the Pavilion x2's tablet portion looks like it's machined from a single block of aluminium. In fact, it's made from several pieces of brushed silver plastic but, until you get your hands on it, you'll be none the wiser. Smooth but angular edges, delicate speaker grilles and a sturdy magnet keeping the keyboard and tablet together make for a premium-looking device.

The IPS screen is a budget-buster too. It's punchy, with a maximum brightness of 327cd/m2 and 1,158:1 contrast ratio, and wide viewing angles mean you don't have to tilt your head to get a good view. Colour coverage is fairly poor, which affects colour vibrancy, but you're unlikely to do better at this price.

We were surprised to find we could get some serious work done on this machine.

You can't have more than one window in focus unless you like thin columns of text, but once you combine deft swipes on the touchpad, prodigious use of Windows 10's Task Switcher and precise prods on the excellent touchscreen, you'd hardly notice you're working on such a tiny laptop. You also won't be constantly checking the battery gauge, as it lasted 7hrs 51mins in our battery test. With modest usage,

✓ The IPS screen is a punchy budget-buster



Acer Aspire R 11 (R3-131T)

A GREAT-LOOKING BUDGET CONVERTIBLE, BUT WINDOWS 10 DRIVER PROBLEMS ARE A SHOWSTOPPER

Ruggedness is an oft-forgotten but important part of a laptop. If you take your computer with you every day, it needs to be able to withstand a few knocks. That's why the colourful shell on the Acer R 11 is more than just a fashion statement.

While our unit came "Cloud White", there is also a "Sky Blue" model available, and both look great. The textured lid doesn't have any give or pick up greasy marks. The rest of the laptop is inflexible and gives you the confidence to chuck the machine around without fear.

The screen isn't half bad, either. While its low contrast levels and 1,366 x 768 resolution are drawbacks, viewing angles are excellent and it uses Corning Gorilla Glass to keep it scratch-free. Flip the

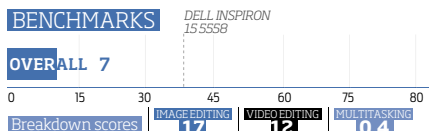
✓ The inflexible lid can withstand a few knocks



laptop around and you have an effective, if weighty, tablet. The speakers are loud, crisp and avoid distortion with loud music.

Performance isn't bad, but the dual-core 1.6GHz Intel Celeron N3050 is a processor that you'll typically find in cheaper laptops. While the extra cost has gone on clever hinges and a touchscreen, it's disappointing that we don't have more grunt. But a time of 8hrs 26mins in our battery test is a welcome by-product. The 802.11ac Wi-Fi is also a good addition, and helps explain the higher price.

However, there were real problems during the Windows 10 installation. A Synaptics driver issue hindered the drag-selection of objects, with a beep



△ The Gorilla Glass screen has great viewing angles

accompanying each error. This made the laptop impossible to use at times. A new driver mostly solved things, but not completely. The device is adorned with a "Windows 10 NOW" sticker – but "Windows 10 NOT QUITE YET" would be more suitable.

Until such issues are rectified, the Toshiba Satellite C40-C is a better bet.

KEY SPECS

\$699 · www.acer.com.au

OVERALL



Asus Transformer Book T100 Chi

UNEXPLAINED DESIGN IDIOSYNCRASIES HOLD BACK THIS OTHERWISE CHARMING TWO-IN-ONE

Every device here comes with compromises. Unless you're willing to pay \$2,000 or more, you aren't going to be able to tick every single box. However, in the case of the Asus Transformer Book T100 Chi, the compromise is a series of design decisions that we can't make head nor tail of.

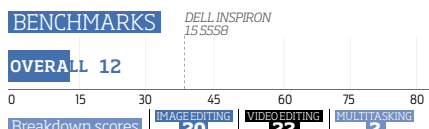
The keyboard and the screen, despite being physically attached by two magnetic prongs, only actually interface over Bluetooth. This causes two problems: the keyboard will eventually run out of battery, and when it does, you'll need to charge it separately from the tablet using a micro-USB connector. Second, there are no USB inputs on the keyboard section. This would be fine if there were ample inputs on the tablet itself, but there aren't. There's a microSD slot to extend the tablet's 64GB of storage, and a USB

✓ You need an adapter to connect USB devices



△ The keyboard only connects via Bluetooth micro-B connector, for which no adapter is supplied in the box at purchase – which is a bewildering decision and means you can't connect conventional USB devices without an adapter. When was the last time you saw a peripheral with a micro-B connector?

This 10.1in tablet and laptop hybrid is



an otherwise excellent little device. It has one of the best screens of any of the devices on test here, with an astoundingly bright backlight, decent contrast levels and very commendable colour accuracy. The diminutive touchpad is satisfyingly responsive, while the admittedly cramped keyboard is also perfectly usable.

Performance is fine, too. The quad-core 1.46GHz Intel Atom Z3775 is a handy little low-power chip that keeps the tablet feeling sprightly with moderate usage, although battery life in our video playback benchmark was the worst on test, at only 2hrs 56mins.

Its design idiosyncrasies, micro-B connector and very short battery life severely hamper a machine that otherwise has the makings of a very promising two-in-one hybrid.

KEY SPECS

\$589 · www.asus.com.au

OVERALL



HP Envy x360

AN IMPROVEMENT ON LAST YEAR'S ENVY, BUT IT DOESN'T DO ENOUGH TO STAND OUT IN THIS COMPANY

At first glance, little has changed on HP's Envy x360 from last year's model. There's the same faux-aluminium chassis, silver keyboard and black bezels around the screen, and the device remains a 15.6in hybrid with a 360-degree hinge.

But instead of just rebadging the 2014 model and hoping the promise of Windows 10 will sell a few more units, HP has made subtle and obvious design changes to keep things fresh. There are the slightly creased and slanting edges of the keyboard tray, sharply cut edges near the screen hinges, and some of the buttons and ports have moved.

The Touch Zone concept, a rubbish touchpad intended to make Windows 8 gestures easier, has been scrapped in favour of a traditional touchpad that

actually works as expected. The keyboard remains the chunky, backlit affair it always was, although it's not as good as the keyboard on the Toshiba Satellite Radius 15, which has a grippier surface and much more pleasing tactile feedback.

It's still no lightweight at 2.3kg, limiting the usefulness of its design – although pushing the screen back until it's almost flat makes the machine more flexible in a range of seating positions.

The touchscreen is responsive and happily complements the touchpad, but we found its colour accuracy and brightness lacking, whereas the Toshiba Satellite Radius 15 is brighter and can display more vibrant colours.

You get a dual-core 2.2GHz Intel Core



^ The screen can be pushed back until it's almost flat i5-5200U processor, 8GB of RAM and a 1TB hard disk. Overall performance is admirable, with the Envy x360 scoring 34 opposed to the Toshiba's 30. Sadly, the battery life doesn't compare – the HP lasted 4hrs 52mins versus Toshiba's 5hrs 48mins.

It's £75 cheaper than the Radius 15, but the Toshiba has a better screen, keyboard and battery, meaning the 2015 Envy fails to live up to its name.

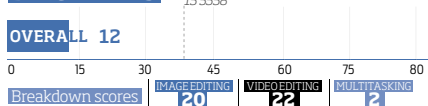
KEY SPECS

\$TBA • www.hp.com/au

OVERALL



BENCHMARKS



Lenovo Yoga 3

A LIMBER 14IN HYBRID WITH A POTENT SPECIFICATION - BUT TOUCHPAD AND PERFORMANCE SETBACKS LEAVE A BAD TASTE

At first glance can leave a lasting impression, which is a shame, because a first glance at the Lenovo Yoga 3 could put you off for life. The aluminium lid is as insipid as they come, but that's hugely misleading: once you open the lid, the black brushed-metal chassis and backlit keyboard look a world away from the dull exterior.

This 14in hybrid isn't exactly unwieldy at 1.7kg, but when you swing the lid around to use the Yoga 3 in tablet mode, you'll soon find yourself looking for a surface on which to rest it. It's impressively thin at only 18mm, and feels every bit like an \$1800 laptop.

In this top-end model, you get a dual-core, Hyper-Threaded 2.4GHz Intel Core i7-5500U, 8GB of RAM and a 256GB SSD, which is generous for the money.

Given the processor's confined chassis, we weren't expecting exceptional benchmark results. We were, however, expecting better performance than the overall score of 33 that it eventually racked up. That puts it a point or two behind the Core i5-5200U-wielding HP Envy x360 and Toshiba Satellite Radius 15. What the benchmarks don't tell you, though, is that in a sprint – opening programs and web pages – the Yoga 3 blitzes the competition. It's only in sustained use that it has to throttle back. Plus, battery life of 6hrs 53mins was one of the better results from this group test, putting it ahead of the Toshiba and HP convertibles.

The combination of a Full HD resolution and IPS panel means images look crisp and colours are consistent from every



angle. Contrast hits an impressive ratio of 1,193:1, but brightness tops out at a paltry 240cd/m2 – not much better than we'd expect from a budget laptop.

Elsewhere, the touchpad is infuriatingly unwilling to activate the two-fingered scrolling gesture, and the touchscreen has a nasty habit of detecting two fingers instead of one, which can lead to unexpected zooming in. It's well built and the specification is mouth-watering, but hampered performance and that ghastly touchpad keep the Yoga 3 from any kind of recommendation.

KEY SPECS

\$1899 • www.lenovo.com/au

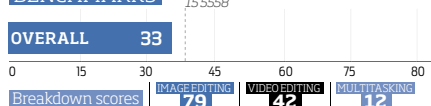
OVERALL



✓ The Lenovo Yoga 3 feels every bit like a \$1800 laptop



BENCHMARKS



Toshiba Satellite Radius 15

A GREAT SCREEN, PREMIUM BUILD QUALITY AND LONG BATTERY LIFE MAKE THE SATELLITE RADIUS 15 A GREAT BUY

The only place we've ever found a 15.6in 360-degree hinged laptop useful is on an aeroplane tray table or in bed. Yet there's plenty more to like about the Satellite Radius 15, beyond those arguably niche use cases.

The Radius 15 is one of the best-looking laptops that Toshiba has produced in a long time, with subtle styling tweaks lifting the Japanese company's mid-range laptop firmly into premium territory. A grippy, backlit keyboard, a very sensitive touchpad and a bright, Full HD IPS touchscreen all combine to make the Radius 15 a terrific laptop for working on. The Radius 15 we are reviewing is a US model, but there's a good chance this, or a revised Au-spec version will make it onsale in Australia.

A 1TB mechanical hard disk will easily

✓ It has three USB ports, an HDMI port and an SD reader



eat up all of your biggest files, while three USB ports (including two USB 3), an HDMI port and an SD card reader keep the Satellite in line with its biggest rivals.

Impressively, Toshiba has managed to set the speakers in such a way that sound radiates from both the top and the bottom of the chassis, meaning you get the same audio quality whatever position it's in. Sadly, that audio quality isn't particularly impressive to start with, and the process of actually hoisting the laptop into a position with the screen front-and-centre is difficult because it weighs a hefty 2.3kg.

The dual-core 2.2GHz Intel Core i5-5200U, coupled with 8GB of RAM, posted an overall score of 30 in our benchmarks. The battery lasted 5hrs 48mins in our test, which could get you through a full day if you switch on all the power-saving options

BENCHMARKS

OVERALL 30

Breakdown scores

DELL INSPIRON 15 5558

66

38

13



^ The Full HD IPS touchscreen is perfect for work

and stick to only essential tasks such as light work.

The Radius 15's nearest rival in this test is the HP Envy x360. However, with better battery life, a more attractive design, a superior screen and comparable performance, the Radius edges ahead of HP's laptop in our reckoning.

KEY SPECS

STBA · www.toshiba.com.au

OVERALL

0 1 2 3 4 5



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View from the Labs

WINDOWS 10 MAKES SENSE OF HYBRID DEVICES, SAYS

MICHAEL PASSINGHAM, BUT IT'S HARD TO SEE WHERE MANUFACTURERS CAN GO NEXT

Windows Vista saw the arrival of the netbook, Windows 7 heralded the arrival of the Ultrabook, and Windows 8 saw tablets and hybrids take to the stage. So what new hardware has Windows 10 ushered in? So far, not much. But that's no bad thing. In fact, I've been impressed with the level of refinement I've seen from all parts of the laptop sector. Netbooks running Windows 10 feel snappy, Ultrabooks are classier than ever and hybrids – which I've tested several of here – feel genuinely usable and finally suited to the touchscreen form factor.

A super-cheap tablet/laptop hybrid is now a genuine alternative to owning an Android tablet and a laptop. If you do minimal work at home and want something to check Facebook on while watching TV, or a device on which to watch Netflix in bed, Intel Atom chips and Windows 10 finally have you covered.

It's not only the bottom end of the market that has impressed. In the mid-range, manufacturers are starting to concentrate on refined designs that give their hybrids and laptops a unique identity and a premium feel. For laptops costing \$1000 or less, this is seriously

impressive.

This really matters for Microsoft. The laptop industry has been eaten away by tablets, with consumers keeping their creaking Windows laptop and buying a new slate instead. Windows is finally a viable option for tablet buyers, not only because of the OS's interface but due

“In the mid-range market, manufacturers are really starting to concentrate on refined designs that give hybrids a premium feel”

to the creeping increase in performance from bottom-end processors.

However, it's not very clear where the laptop industry can go next. My feeling is that passively cooled, ultra-low-power chips, such as Intel's Core M processors, will creep their way into budget laptops in the next couple of years. This means smaller, lighter kit for less money than ever before, but with the performance you'd expect from

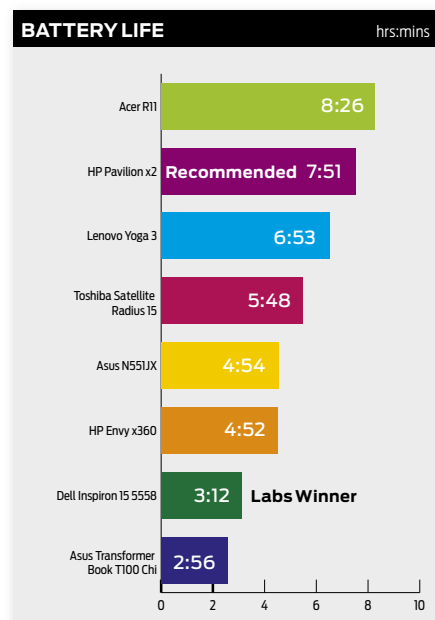
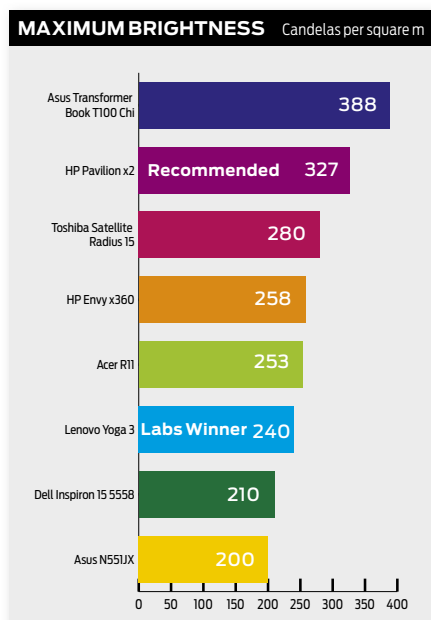
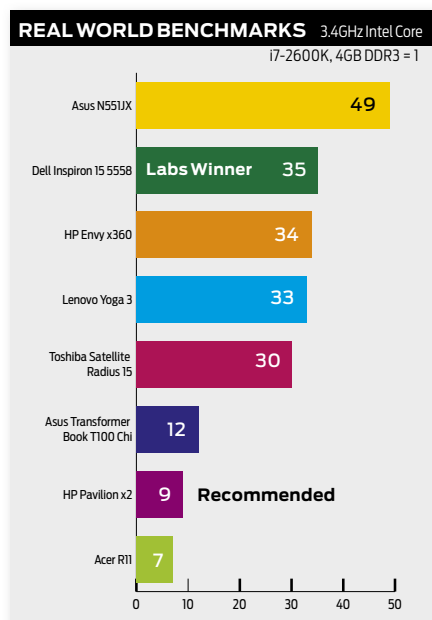


a Core i3-powered laptop that costs \$800 today.

Chromebooks are still a threat to Windows 10, with their lightweight operating systems and sub-\$400 price making them hugely attractive in retail. Microsoft appeared to be countering that elegantly by bundling 1TB of OneDrive storage and free subscriptions to Office 365 with low-end Windows 8.1 devices, but that offer appears to have expired, which make some of the 32GB laptops look a little barren. However, with OneDrive and Microsoft's other online services now fully integrated into Windows 10, expect to see more of a push for cloud services.

Microsoft isn't the only player in this market any more, but that's great for innovation, competition and, ultimately, the consumer. If anyone tells you the iPad Pro is going to kill off the Windows laptop, send them my way. ●

Test results





The best reason to buy an iPad

Your other favourite technology magazine now has an iPad edition featuring everything you love in the magazine plus exclusive extras each month including additional photography and video. Change the way you view your tech. Head to iTunes now to download the app.

The power to connect **Thunderbolt 3**

Intel delivers a truly next-gen connectivity standard

While much ado has been made about the wide availability of USB 3.0 and USB 3.1 with the launch of Intel's 6th Generation Core processor, it's not the only high-speed connection to become mainstream in 2015. The Thunderbolt interface has been around for several years now, but only now is it starting to become a common component on today's performance motherboards. Like USB it offers incredibly fast data transfer speeds, but it's even faster than the latest versions of USB, which allows it to do things that USB simply can't.

Thunderbolt 3 is the latest version of this high-speed interface, and is the version that will appear on new motherboards thanks to its blistering transfer speeds. The maximum theoretical speed of Thunderbolt 3 is an incredible 5 Gigabytes per second, or 40Gbps, whereas USB 3.1 is 10Gbps, making Thunderbolt 3 four times faster. USB 3.0 maxes out at 640 Megabytes per second, or 480Mbps, making Thunderbolt 3 almost ten times faster. This makes Thunderbolt 3 the undeniable speed leader when it comes to transferring files to and from the PC, provided it's married with a matching Thunderbolt 3 external hard drive.

However, Thunderbolt 3 is designed to do more than simply connect speedy hard drives and other peripherals to the PC; it's also designed to connect extra displays. Thunderbolt 3 encapsulates the DisplayPort 1.2 standard, and has the bandwidth to power not one, but two 4K displays using the DP 1.2. It will also be able to drive a single 5K 60Hz display when these become more commonplace.

WHICH PLUG DOES IT USE?

Earlier versions of Thunderbolt used a Mini-DisplayPort plug, but version 3 has settled on the new USB Type-C connector, which is the same plug used by many USB 3.0 and 3.1 connections. Unlike USB Type-A plugs, the latest version doesn't have to be oriented in a certain direction to fit into the plug - there is no "right-side-up" on this plug, making it much easier to plug in. It also delivers 100W

"Thunderbolt 3 is designed to do more than simply connect speedy hard drives and peripherals"

of power, which means external devices will no longer need an extra power cable to function.

Another unique feature of Thunderbolt is its ability to daisy-chain devices. This means that even though a PC may only have one Thunderbolt port, the device plugged into that port may also have its own Thunderbolt port, into which another device can be plugged. In this way up to six devices can be daisy-chained to the PC via a single Thunderbolt 3 port.

THUNDERBOLT CABLES

Due to the high-speed of Thunderbolt 3, special cables are required to function at the fastest speeds. The current maximum length of a full-speed Thunderbolt 3 cable

is three meters, but it must be an "active" cable to reach top speeds over this distance, and these cables now retail for around \$100. However, Intel recently announced "passive" cables using the USB Type-C connector that will be much cheaper, and will drop to a speed of 20Gbps. This is half the speed of an active cable, yet still twice the speed of USB 3.1. In the next twelve months special optical cables for Thunderbolt 3 are expected, which will increase the maximum length to a vast 60 meters yet still deliver the top speed of the standard.

One interesting use of the new Thunderbolt 3 connection is external graphics, which is sure to prove popular amongst laptop makers. When the laptop is in road-mode, it uses the integrated GPU found on today's Intel CPUs, but when the owner returns home and wants to game, the laptop can be plugged into an external graphics dock via Thunderbolt. This dock contains a dedicated desktop GPU, delivering premium game performance when the gamer needs it most.

To ensure your new motherboard has Thunderbolt 3 support, look for the inclusion of the Intel Alpine Ridge controller.



✓ Support is quickly taking off, with Apple among the first to embrace Thunderbolt 3



upgrade
AUSTRALIA 2.0



Plantronics RIG 500

NICE, PRICE, DECENT SOUND,
FUNKY LOOKS, VERY COMFY

When Plantronics launched the RIG brand a few years ago they hit upon the right mix of prestige features and price point. With the new RIG 500, Plantronics has once again hit that sweet spot, albeit in a different manner. The RIG 500 headset is built for both value and comfort without compromising excellent stereo performance. Each of the ear cups sports a crisp 40mm driver that delivers solid sound from bass through treble with a small amount of accentuation on the lower register and the memory foam cushions don't turn your ears into hideous sweat monsters within minutes.

The fold up boom mic offers good clarity for skype and game chat, but more importantly it is set to mute when flipped up so won't capture any noise when not needed. The most impressive feature of the RIG 500 is the modular design that allows users to choose from three different heights for the ear cups, which in turn affect the tightness of the band and head strap. More aftermarket modular options will also be available soon. The result is an extremely comfortable, very light headset that offers excellent stereo performance for the price.

Daniel Wilks

KEY SPECS

\$99.95 • www.plantronics.com/au
Modular design • stereo audio • gaming boom mic

OVERALL



CM Storm Quickfire XT

A TASTEFULLY DESIGNED BOARD
THAT FEELS TERRIFIC TO USE

Quickfire XT is a class act with some charms, and a killer punch. Available in Cherry Red, Brown or Blue, the keystrokes on our test Brown unit felt oddly clackier than the normally semi-slushy Browns. So Cooler Master has done something to the mechanism, and I quite like it. It's great for day to day typing, though is a little noisier than expected.

But the killer party trick is that instead of the crappy, laborious, fiddly software most gaming keyboard impose on you, the Quickfire XT uses a FN + F-key combo d media. Besides freeing up your PC of one more background app, this lets you make adjustments in game without alt-tabbing out. Good job, Cooler Master.

At \$189 it sits squarely against the likes of Corsair's K-series, and those sexy aluminium top panels. The Quickfire is plastic, but it's the solid, trustworthy type. The keys have a special coating that gives a nice amount of grip, feeling very nice to the touch. Overall this is one of the nicer mechanicals in a very crowded market.

Ben Mansill

KEY SPECS

\$189 • Gaming.coolermaster.com
Cherry Blue, Brown and Red switch models available •
backlit with 35 colours and five settings

OVERALL



Corsair Scimitar

MORE BUTTONS THAN
PADDINGTON BEAR'S OVERCOAT

Purpose-built for MOBA and MMO gaming, Corsair's Scimitar brings a couple of important new features to the gaming table. First and most obvious is the festoon of buttonage on the side. At first glance one might wonder how it is possible to accurately select, say, a button in the centre without also mashing the surrounding buttons. And fair enough too. So besides simply playing with it for long enough for muscle memory to take hold, you have the benefit of alternating textures to help your thumb find its way. Nice, but nicer is that the whole button assembly can be slid back and forward by almost a centimetre, then locked into place where you find most ergonomic comfort. It may sound like a small thing, but MMO players know that with this many buttons the position needs to be perfect.

Comfort overall is very good. It's large in the palm and thus allows the hand to fully rest on the top, which is lovely for long sessions. The wheel is big, chunky and also illuminated, as is almost everything else and naturally you can customise the colours.

Lastly, you can set up to 12,000DPI which is too quick for regular use, but could be good for 4k and/or multiple monitors.

Ben Mansill

KEY SPECS

\$119 • www.corsair.com
17 programmable buttons with mechanical switches • RGB
lighting • up to 12,000DPI

OVERALL





World of Warships

OUT OF BETA AND INTO THE LINE OF FIRE

If you've been keeping up with our ongoing previews of World of Warships you've likely got a good idea of what the game is about. But, in case you've been stuck in figurative port and haven't been beating about on the high-seas, here's the gist of the game.

One of Wargaming's stable of free-to-play wargames, World of Warships focuses on naval warfare from the First World War to beyond the second, essentially watching the age of battleships morph into the carrier age. You control your choice from four different classes of ships, with some radically different play styles. In the 16 versus 16 battles supplied (with a few exceptions) Warships manages to deliver a different, and yet reliably challenging, battle every time.

If you like faster gameplay and the potential for massive damage, you're going to love destroyers and their torpedoes. Cruisers are bigger and tougher, though still quite fast, and many have torpedoes too. Then there are battleships, with their mighty big guns and immense capacity for absorbing damage. Finally, there are aircraft carriers, which play more like an RTS, complete

with a top-down map view to let you control your squadrons of fighters, bombers, and torpedo bombers.

Like the other games, you can have a number of ships in port, so that while you may have one destroyed in a battle, and therefore effectively 'locked' until it's over, but still be able to play on another ship. If you're serious about progressing through each tech tree, earning XP and unlocking new equipment, you'll want to play on each of your ships at least once a day, as the first victory on a ship always delivers an XP bonus.

At time of writing there are only two tech trees in the game, American and Japanese, though German, British, and Russian are set to come in the following months. However, the game is, at launch, effectively feature-complete.

But the grind of unlocking new ships is only a portion of what makes the game so addictive. The real meat is of course the sea battles, which take place on a range of maps that go from perfectly empty ocean, to ice-floes and various island archipelagos. The different maps, combined with different modes (one, three or five capture points; splitting fleets into two, and so on) means each map is quite unique, and just the presence of absence of a carrier can make a huge change to the game dynamic.

What's really impressive is how well real-world tactics translate into the game. Battleships are best when they form a line of battle and concentrate fire on a single target, while agile destroyers working in a pack can threaten even the heaviest of ships. Cruisers are versatile in almost any role, but later models – with heavy anti-air-craft defences – excel at



protecting the heavy carriers. Controlling every class of vessel is made as easy as possible thanks to a very clear and well-designed user interface, which shows you the position of your vessel's many turrets, how long it will take them to converge on target, reload times, and more. You can switch between low damage, but high crit HE rounds, or stick with high penetration AP rounds – usually the better choice. Other limited equipment includes spotter planes, engine boosts, and the very handy smoke screens that are the unique domain of fast destroyers.

On top of that, you can also earn signal flags for achieving various in-game feats, which you can then adorn your ships with for in-game bonuses. For instance, if you're unlucky enough to be hit and destroyed by a magazine explosion (a one-shot kill for even the biggest ships), you get a limited number of flags that will prevent that critical for the next few matches.

When all of these units work together, victory feels like a true achievement, and even defeat at least lets you go down bravely fighting. However, like many online games dominated by pick-up teams, all too often there's no teamwork at all, and despite all your efforts, you're entire fleet gets destroyed for little damage to the enemy. Organising a good strategy gets even harder because of the language differences in our region – there must be close to a dozen different languages in the South East Asia server region.

Wargaming really deserves a lot of praise for World of Warships. It's an altogether slower, maybe even more cerebral, entry than previous titles, and the rather elegant pace of the game is a breath of fresh air.

David Hollingworth

KEY SPECS

www.wargaming.net

Genre - Free-to-play · Developer - Wargaming · Publisher - Wargaming · Platform - PC

OVERALL





Star Wars: Battlefront beta report

WITH GAME ON THE EDGE OF RELEASE, HERE'S WHAT WE LEARNED FROM THE ALL-TOO-SHORT BETA

Between different maps and modes in the upcoming Star Wars: Battlefront, there's going to be a LOT of content on offer. The beta however, only offered a taste, with three maps, each focused on a single mode. But what a tantalising taste that was.

Before we get into the game's mechanics however, it's probably worth talking about how it feels. That may seem wishy-washy to some, but this is Star Wars, and over a three films (yes, there are only three films!) the series has built up quite a strong set of visual and audio clues. This rich vein of nostalgia has been lovingly mined by DICE, and has resulted in an experience that is about as authentically 'Star Wars' as you can get. Blaster-bolts whine and pop across the screen, explosions are flashy and billow with white smoke, while fighters roar overhead. From the snow of Hoth to the bare rocks of Tatooine's canyons, the sense of being in the Star Wars universe is amazingly impressive.

And when that oh-so-familiar score starts to swell, well... Look at it this way – if all you could do in the game was walk around these locations, it'd be worth it.

There is a game, however, and even the limited selection of modes offered a range of different experiences.

The centrepiece mode, and easily the

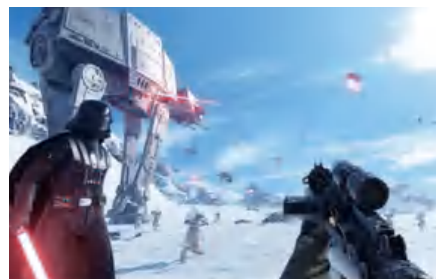
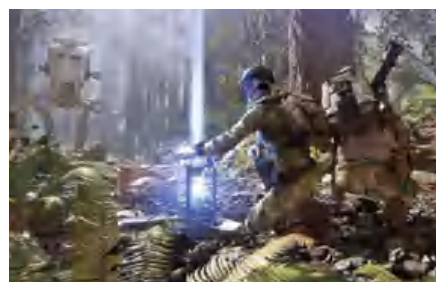
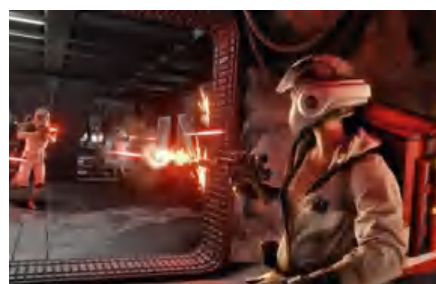
biggest, was Walker Assault on Hoth. This map recreates the classic battle that opens up The Empire Strikes Back, complete with AT-ATs, AT-STs, and Snowspeeders zooming about. These are joined by waves of infantry from both sides, X-wings and TIE Fighters, and two classic heroes – Darth Vader and Luke Skywalker.

The aim of the map is for both sides to secure capture points, which represent relays for calling in Y-Wing bombers. So, the Rebels want them, so the bombers can immobilise the AT-ATs, so they can be damaged, and the Imperials want to stop it, because those AT-ATs are what you need to eventually blow up the Rebel shield generators.

Interestingly, this is a map that DICE has said they will be working on to better balance it in favour of the Rebels, who rarely win. We think that's a shame – 'historically' (yeah, I know, it's make believe) the Imperials do actually win pretty easily, despite a spirited Rebel defence, so working to make that the standard outcome is kind of cool. And when the Rebels do manage to win, it really is exhilarating.

It also shows off a lot of the game's features in grand style.

Progression is based on card unlocks, which you can place in a three-card





a lot of bolts at enemies, leaving your weapon to overheat quite a lot.

And the weapons generally leave a lot to be desired in terms of accuracy (insert Stormtrooper joke here), too. You can fire from the hip, or you can bring up a weapon's scope, but there's no intermediate ironsight option. In fact,

“the guy who managed to get on top of a moving AT-AT so he could snipe everyone around him”

some players in the beta felt that using the scope was really a waste of time, as it takes longer, and the increase in view distance doesn't quite make up for that.

But the game's scope more than makes up for this, and the feeling of invincibility you get when you manage to find a power-up for an AT-ST, or to control the AT-AT's main guns, is something else.

What's interesting is that the blasters are much more lethal in the solo/two-player co-op. Here you face waves of enemies as you defend drop-pods. Beat six waves and you win. Most are basic Stormtroopers, and these die much easier than enemies in multiplayer – it really makes me wish there was a Hardcore mode that was more like this in the main event. That said, successive waves introduce tougher specialist troopers, and even AT-STs. It's a fun introduction to a lot of game's mechanics and likely a good place for new players to start.

The last mode on show in the beta pitted smaller teams against each other in securing drop-sites. It's fun enough, but easily the weakest of the three, as the changing capture points and respawn locations make for a much more chaotic experience, without the defined lines of Walker Assault.

If you're looking for a Star Wars-themed Battlefield experience, Battlefront may be a disappointment. But if you can take on board the more arcade-like gameplay, and simply enjoy the intense feel of being inside the films, you'll have a lot of fun. And with impressive implementations of some of the most iconic science fiction vehicles of all time, Battlefront certainly delivers a truly unique experience.

David Hollingworth

KEY SPECS

starwars.ea.com/en_AU/starwars/battlefront

Genre - Action • Developer - EA Digital Illusions/EA DICE • Publisher - EA • Platform - PC, PS4 and XBOne



'hand' to create custom equipment packages. You might combine a Thermal Detonator with a Jet-pack and a Squad Shield, all of which can be deployed multiple times in game, based on a simple cool-down mechanic. You can also choose what your main weapon is from a small selection of blasters, which we expect to be expanded in the full release. There's also the capacity to customise your in-game appearance, though this wasn't activated in the beta – but it looks like it will be fun, and the addition of female voices and models is certainly very welcome.

The limited range of equipment we saw in the beta certainly has some really interesting options for different play-styles. A one-shot rifle lets you snipe enemies and light equipment, while different grenades give you some interesting options for mass destruction. The Jet-pack in particular is a fascinating piece of kit – once triggered, you can't control it. It really is just a jet on your back. It's handy, but certainly not over-powered.

Unless you're that guy who managed to get on top of a moving AT-AT so he could snipe everyone around him.

The progression system seems designed to be much friendlier to non-traditional FPS gamers, and the gameplay itself follows suit. Anyone expecting the grittier feel of Battlefield combat will be disappointed, as Battlefront feels much more arcade-like; not necessarily in a bad way, but it's true nonetheless. Instant kills are near-impossible, and you'll find yourself firing



The A-List

ONLY THE BEST OF THE BEST MAKE IT TO PC & TECH AUTHORITY'S A-LIST

We don't make a change to these pages prior to having published a full review of a product, but the arrival of the new Sony Xperia Z5 smartphone has almost made us reconsider that policy.

This phone is a gem. Its battery life is remarkable, easily managing two days without a charge, it is water and dust resistant, and the shape is something to behold – it looks fantastic, and unlike the Samsung Galaxy S6 Edge, it can be held with fat fingers without fear of accidentally starting apps, or dropping it because the Edge's thin sides make it tricky to hold.

So, we're leaving the S6 in there until we have completed our review of the Xperia Z5, which you can expect next issue. If you can't wait, take a look at the PC & Tech Authority site for our first impressions.



PC DESKTOP

ALL-IN-ONE
Apple iMac 27in

★★★★★

PRICE \$2,199

SUPPLIER www.apple.com/au

If you can afford it, the 27in iMac is the finest piece of all-in-one engineering on the market. A truly powerful beast with performance to match its looks.

SPECIFICATIONS 3.2GHz quad-core Intel Core i5; 8GB DDR3 RAM; 1TB Western Digital Caviar Black HDD; NVIDIA GeForce GT 750M 1GB; 27in 2560 x 1440 LCD.



PERIPHERALS

WIRELESS ROUTER Netgear
Nighthawk X6 AC3200

★★★★★

SUPPLIER www.netgear.com.au

Designed to keep pace with high-bandwidth content consumption, it is the router King.

SPECIFICATIONS 1GHz dual core processor with 3 offload processors, 6 High performance antennas, one 2.4GHz band and two 5GHz Wi-Fi bands

DESKTOP STORAGE CalDigit T3
with Thunderbolt 2

★★★★★

SUPPLIER www.amazon.com

The T3 is an expensive RAID device, but when you factor in the drives and the capacity included, it's good value.

SPECIFICATIONS 6/9/12/15TB external hard disk with RAID; Thunderbolt and Thunderbolt 2, 135 x 241 x 116mm 4.5kg.



NAS Synology
Diskstation DS415play

★★★★★

SUPPLIER www.synology.com

For most home users, the DS415play is very impressive. It's an all in one box that can literally do it all.

SPECIFICATIONS 4x SATA 3 2.5"/3.5" drive bays • Intel Atom Dual Core 1.6GHz CPU • 1GB DDR3 RAM • 2x USB 3.0 & 3x USB 2.0 • 1x Gigabit Ethernet

ALL-IN-ONE PRINTER
Canon Pixma IP 8760

★★★★★

SUPPLIER www.canon.com.au

This Canon can do it all, and at a reasonable price.

SPECIFICATIONS 9600 x 2400dpi print; 2400 x 4800ppi scan; USB 2; 802.11n WLAN; 150-sheet tray

LASER PRINTER Dell B1160w

★★★★★

SUPPLIER www.dell.com.au

The best all-rounder in our printer group test, with excellent text printing and decent costs.

SPECIFICATIONS 1800 x 600dpi resolution; USB 2; Wi-Fi; 150-sheet input trays; 331 x 215 x 178

LAPTOPS



VALUE Asus TF103C

★★★★★

PRICE \$429**SUPPLIER** www.asus.com.au

While ostensibly a tablet with a removable keyboard, it also fits tidily into the value portable category thanks to its immense usability and remarkably low price.

SPECIFICATIONS Quad-core 1.86GHz Intel Atom Z3745 • 1GB RAM • 8GB/16GB eMMC storage • 10.1in 1,280 x 800 IPS display • dual-band 802.11n Wi-Fi



PERFORMANCE Aorus X7

★★★★★

PRICE \$2,999**SUPPLIER** www.aorus.com

Super-sleek, light, outrageously powerful and with a spec-list that outclasses many high end desktop systems.

SPECIFICATIONS Q4-3.4GHz i7-4700HQ • 4GB/8GB DDR3L 1600, 4 slots (Max 32GB) • 17.3" Full HD 1920x1080 • NVIDIA® GTX 765M SLI GDDR5 4GB • mSATA 128GB/256GB, 2slot 2.5" HDD 500GB/750GB/1TB 5400rpm



PROFESSIONAL Apple Macbook Pro Retina

★★★★★

PRICE \$2,799**SUPPLIER** www.apple.com/au

We've selected the 2.9GHz i5 model with 8GB of RAM and a 512GB SSD. Doubling the RAM adds another \$280. Some may find, though, the 13in screen size to be limiting.

SPECIFICATIONS 2.9GHz Intel Core i5; 8GB RAM; 512GB SSD; 13in 2560 x 1600 LCD; 2 x USB 3; 2 x Thunderbolt 2; dual-band 802.11ac abgn Wi-Fi



ULTRA PORTABLE Microsoft Surface Pro 3

★★★★★

PRICE \$1,571**SUPPLIER** www.microsoft.com.au

Attach the Type Cover 2 and it's as good, if not better, than any 'proper' ultra portable laptop. It took three versions, but Microsoft has nailed this format. At least an i5 is recommended.

SPECIFICATIONS 1.9GHz Intel Core i5-4300U; 12in touchscreen (2160 x 1440); 8GB RAM; 256GB SSD; 802.11ac/abgn; Bluetooth 4

HANDHELDS

SMARTPHONE Samsung Galaxy S6

★★★★★

PRICE \$899**SUPPLIER** www.samsung.com.au

If only the best will do, look no further: the Samsung Galaxy S6 is the best smartphone on the market.

SPECIFICATIONS 25GHz Qualcomm Snapdragon Octa-core 2.1GHz/1.5GHz ARM Exynos 7420 SoC • ARM Mali-T760 GPU • 3GB RAM • 32/64/128GB storage • 5.1in 4K video • 2,550mAh battery • 1yr RTB warranty • 71 x 6.8 x 143mm (WDH) 1138g



TABLET Apple iPad Air 2

★★★★★

PRICE \$699 (16GB, Wi-Fi)**SUPPLIER**www.apple.com/au

The iPad Air 2 is definitively the best tablet on the market right now, and rightfully replaces its predecessor on our A-List.

SPECIFICATIONS 1.5GHz Apple A8X SoC • 2GB RAM • 16/64/128GB storage • 9.7in 1,536 x 2,048 IPS display • 7,340mAh battery



EBOOK READER Kindle Paperwhite

★★★★★

PRICE \$119**SUPPLIER**

www.amazon
The premium Kindle goes the extra mile, with a n attractive de lower weight, swanky page-turn buttons and better contrast.

SPECIFICATIONS 6in 1,072 x 1,448 E Ink Carta display • 2GB storage • single-band 802.11n Wi-Fi • optional 3G • 1yr RTB warranty • 117 x 9.1 x 169mm (WDH)



SMARTWATCH Apple Watch Sport

★★★★★

PRICE \$499**SUPPLIER**www.apple.com/au

This is not only our pick of Apple Watches, but of the smart watch market overall at this point in time. Good features, gr app support and so nice to use.

SPECIFICATIONS 340 x 272 AMOLED • 512MB/8GB • 205 mAh iOS 8.2+



SOFTWARE

SECURITY Norton Security 2015

★★★★★

SUPPLIER www.norton.com/security
Great malware protection and equally good legitimate software recognition

BACK UP Acronis True Image 2015

★★★★★

SUPPLIER www.acronis.com.au
The 2015 version adds full-system backup and dual backup and unlimited cloud storage.

OFFICE SUITE Microsoft Office 365 Home Premium

★★★★★

SUPPLIER www.microsoft.com.au
The easiest to use Office to date.



WEB DEV Adobe Dreamweaver CS6

★★★★★

SUPPLIER www.adobe.com.au
This edition makes PHP and CMS its core focus.



AUDIO Cubase 7.5

★★★★★

SUPPLIER www.steinberg.net

The addition of better filters solidifies this program's continued place on the A-List.



VIDEO Sony Vegas Movie Studio HD Platinum 11

★★★★★

SUPPLIER www.sony.com.au
May not have the bells and whistles of other consumer editing packages, but its tools are efficient.



PHOTO Adobe Photoshop Lightroom 6

★★★★★

SUPPLIER www.adobe.com.au
Lightroom 6 doesn't add up to a revolutionary update, but it improves on what was already an exceptional piece of software.



The Kitlog

DREAM BUILDS WITH REAL GEAR

After last month's major shake-up, we were not expecting any big changes this month. And so it goes, after finishing this month's reviews that we are able to leave things as they are for this month.

A word of note, our aim for the Game Box is to achieve satisfying game performance without spending up too much. For this reason we're not including a monitor like the Acer XR341CK. It surely is a wonderful screen, but for nearly \$1500 it pushes the overall price up too much, that said, if your budget can handle it jump in with both feet, you won't be disappointed.

Conversely, while we looked at some very impressive budget motherboards in a group test this month, we still feel that the Asus Z170 Pro Gaming is worth the extra \$100 or so for more expansion options and better onboard audio than we typically saw in the budget boards.

THE GAME BOX

CPU		INTEL CORE I5 6600K PRICE \$359 Gaming generally doesn't make use of hyper-threading which makes this the CPU of choice for this box.
MOTHERBOARD		ASUS Z170 PRO GAMING PRICE \$279 Our Skylake Value Award winner, it packs in a complete set of features yet is priced reasonably. Good audio also means we don't need a sound card.
MEMORY		8GB OF DDR4 PRICE \$120 The speed and brand makes so little difference to performance we can't recommend one over another.
VIDEOCARD		NVIDIA GTX 970 PRICE \$500 Quiet, sips power, but when the performance is needed this blazer eats the frai..

THE PERFECT PC

CPU		INTEL CORE I7 6700K PRICE \$525 Intel's top-shelf unlocked i7 CPU.
MOTHERBOARD		GIGABYTE GA-170X GAMING G1 PRICE \$800 The most complete 100-series motherboard you can buy today.
MEMORY		32GB OF DDR4 PRICE \$430 For a general-purpose build 16GB is all you need, but go big if you know you need more.
VIDEOCARD		MSI GTX 980TI GAMING 6G PRICE \$1089 Faster than a Titan X and several hundred dollars cheaper this is the 980TI to have right r

TOTAL: \$2851 RIG ONLY: \$1967

COOLER

**COOLERMASTER NEPTON 140XL****PRICE** \$120

Easy to install AIO CPU cooling, relative quiet and performance to rival twin-radiator units.

CASE

**BITFENIX RONIN****PRICE** \$99

BitFenix continues to deliver great budget cases that look terrific and are easy to build in.

SYSTEMDRIVES

SAMSUNG 850 PRO 512GB**PRICE** \$365

This SSD offers greatly improved durability. Supplement it with a hard drive of your choice if needed.



KEYBOARD

CORSAIR K70**PRICE** \$170

The glorious perfection mechanical keys with thought-out gamer d



DISPLAY

**LG IPS277L****PRICE** \$499

27 inches of IPS glory. The resolution isn't perfect, but the price is. The thin bezel makes this a very attractive screen.

MOUSE

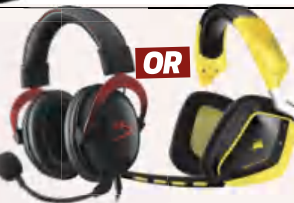
**CM STORM REAPER****PRICE** \$85

Perfect feel, though a little large and heavy for some tastes, a lighter alternative is the Turtle Beach Grip 300 (\$54)

AUDIO

HYPER CLOUD**PRICE** \$149

The HyperX Cloud II provide excellent sound quality and not just for the price range.

**OR****CORSAIR VOID****PRICE** \$130

The USB 7.1 model is the best balance between price and performance.

POWER SUPPLY

COOLER MASTER G750M**PRICE** \$125

Outstanding value for money, it's powerful enough for even performance PCs packing twin GPUs.

**TOTAL: \$8127 RIG ONLY: \$6820**

COOLER

**CORSAIR H100i GTX WATER COOLER****PRICE** \$179

Excellent cooling that is easy to install with advanced monitoring.

CASE

**ANTEC S10****PRICE** \$699

If you absolutely must have what is very nearly the best case we've seen, this is the one.

SSDS

INTEL 750 1.2TB SSD**PRICE** \$1499

This NVMe SSD is easily the fastest consumer drive we have tested, and by a large margin.

**2 X HYPERX PREDATOR 480GB PCIe/M.2 SSD****PRICE** \$1200 (\$600ea)
A pair of these in RAID 0

KEYBOARD

CORSAIR VENGEANCE K95**PRICE** \$189

The perfect keyboard. Lovely Cherry Red mechanical switches, a slick and attractive aluminium body and customisable backlighting make this The One.



HDDS

ANY HDD**PRICE** \$100 (2TB)

Supplement the SSD with cheap HDD storage.



MOUSE

**CM STORM REAPER****PRICE** \$85

Very solid and feels fantastic under the hand with sweet on-screen movement.

AUDIO

**PHILIPS BDM4065UC 4K 40"****PRICE** \$1033

It's huge, remarkable value and having one in front of you is PC paradise.

POWER SUPPLY

CORSAIR HX1000i**PRICE** \$299

Corsair's mighty HX1000i pumps out extremely reliable power, even when under full loads.



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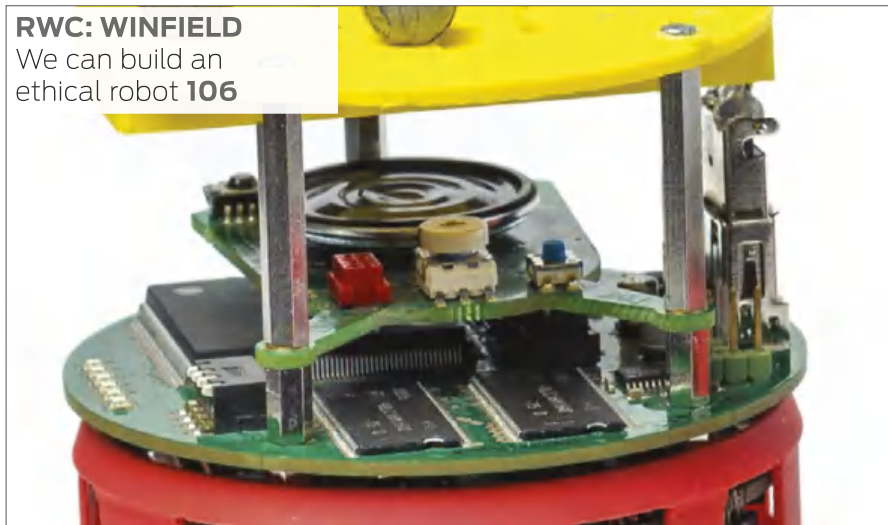
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THE BACK SECTION

Real world experience, the newest of the new in tech and some strong opinion

RWC: WINFIELD

We can build an ethical robot **106**



FUTURES

Canon's 250-megapixel camera sensor **95**



RWC: HONEYBALL

Online spooks **100**

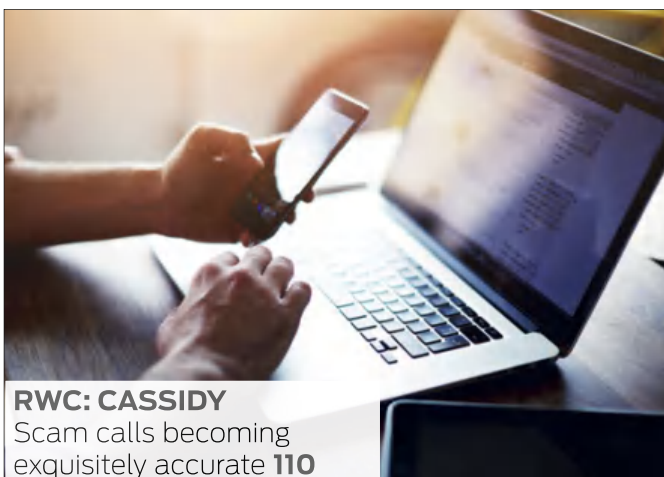
FUTURES

Making gesture recognition work



RWC: WINDER

Choosing the most secure handset is less straightforward **108**



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Scam calls becoming exquisitely accurate **110**

FUTURES

eSports: taking gaming seriously **92**





MAXIMISE YOUR BATTERY LIFE IN WINDOWS 10

IFTTT - If This Then That - is a free service that connects together a huge range of devices and systems. **Darien Graham-Smith** discovers how it can make your life easier

When you flick through PC Pro, you'll regularly come across exciting new gadgets and technical innovations – but these can come at a high price, in terms of both money and electrical power. For example, today's high-DPI screens may be super-sharp, but they often consume more power than Full HD panels.

A lot of work goes into driving down energy consumption – Intel's newest Skylake processors are the company's most efficient yet, thanks to the cutting-edge 14nm manufacturing process and a host of clever energy-saving design tricks. However, no matter how advanced our processors and screens become, or whether or not power-efficient SSD drives and graphics chipsets replace heavyweight spinning disks and graphics cards, our mobile devices remain hamstrung by the inescapable issue of battery life.

Battery technology hasn't changed much over the past couple of decades. The lithium-ion batteries found in modern laptops and tablets overcame the "memory effect", reducing power drain when a device isn't being used – but we're still waiting for an advance

"Despite their best efforts, you still need to keep your charger close at hand, even for a brand-new Win 10 laptop"

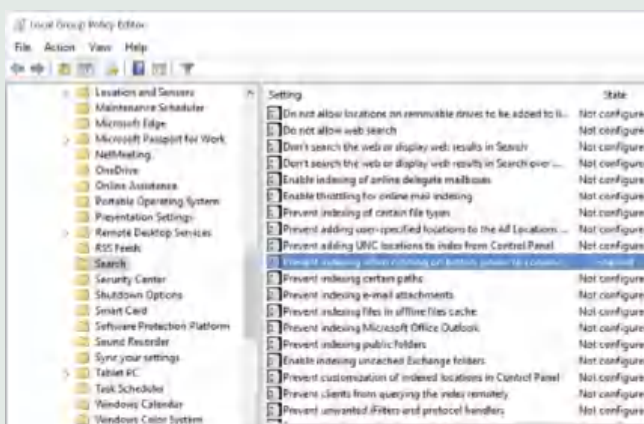
in technology that will significantly extend the amount of charge that can be stored in a regular cell. Many companies have dedicated research departments tackling this problem, but currently there's nothing on the horizon. This means savings have to be found

elsewhere, which is why companies such as Intel are now focusing on power-efficiency far more than on actual processing grunt.

Despite their best efforts, you still need to keep your charger close at hand, even for a brand-new Windows 10 laptop or tablet. But that doesn't mean you should squint at a dim screen, or put your device into flight mode to squeeze as much as possible out of the battery. With careful tweaking and streamlining of your Windows 10 installation, you can expect to boost your battery life by as much as 30%.

We'll look at some of the many ways you can extend the battery life of your Windows 10 laptop, tablet or smartphone – and how you can harness useful features in Microsoft's new OS such as the new battery-saving mode, automatic brightness control and even the new Office Mobile apps, all to extend your operating time.

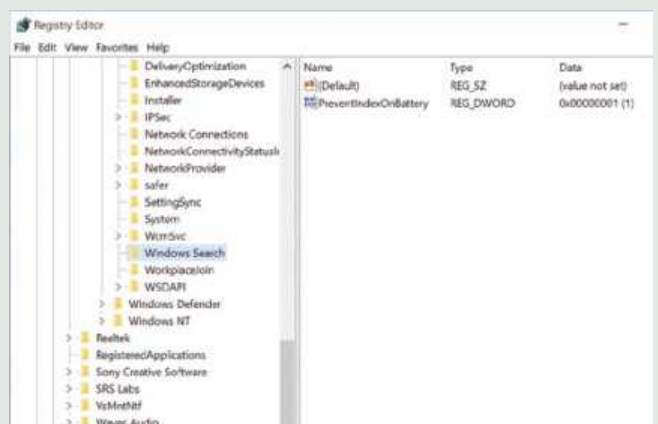
USING GROUP POLICY TO SAVE POWER



1 An easy way to save battery life – especially if your laptop has a mechanical disk – is to disable search indexing when running on battery power, so Windows isn't constantly accessing the disk. If you're using Windows 10 Professional or Enterprise, this is achieved through the Group Policy editor.

Open it by searching for "gpedit", and click on the "Edit group policy" link when it appears. Then navigate to Computer Configuration | Administrative Templates | Windows Components | Search.

You'll see an option entitled "Prevent indexing when running on battery power to conserve energy" – double-click on this, select Enabled and click OK.



2 If you're using Windows 10 Home (or a Home Edition of a previous Windows version), you won't have access to the Group Policy editor – but you can activate the same setting by editing the Registry. Needless to say, you should do this only if you're comfortable making this type of change. However, it isn't a difficult process. Search for "regedit" to open the Registry editor, then navigate to HKEY_LOCAL_MACHINE\SOFTWARE\Policies\Microsoft\Windows\Windows Search. If you don't see a folder of that name within the Windows folder, create it. Then, in the Windows Search folder, create a new DWORD value called "PreventIndexOnBattery" and give it a value of 1. Restart Windows to make the new setting take effect.

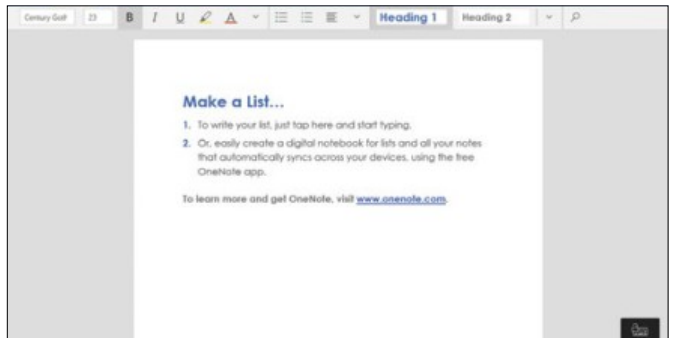


SIX SETTINGS to make Windows more power-efficient



SET THE POWER BUTTON TO SHUT DOWN RATHER THAN SLEEP

Windows 10 starts up in less than 20 seconds, so you can afford to shut it down when it isn't in use. In the Windows Power Options, click "Choose what the power buttons do", and change the "On" battery options for the power button and lid to "Shut down". You can also set your screen to turn off when the device is idle: you'll find this option in the Settings app under Power & sleep.



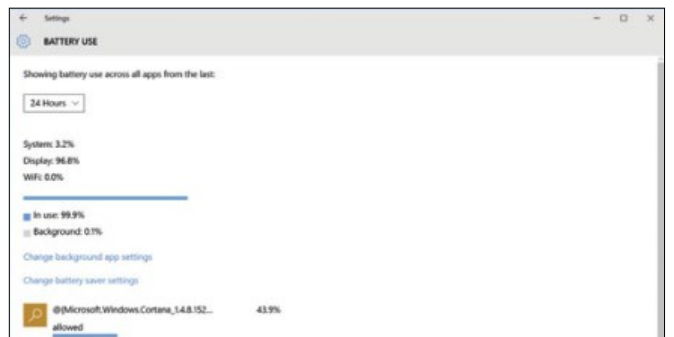
USE WINDOWS STORE APPS

Desktop applications use system resources and, therefore, power – even if you're not interacting with them directly. However, Windows Store apps are automatically suspended by the OS when in the background, so they don't eat up the battery. This includes the new Office Mobile apps (Word, Excel and PowerPoint), so switching to them can save considerable battery life, especially compared to the desktop suite.



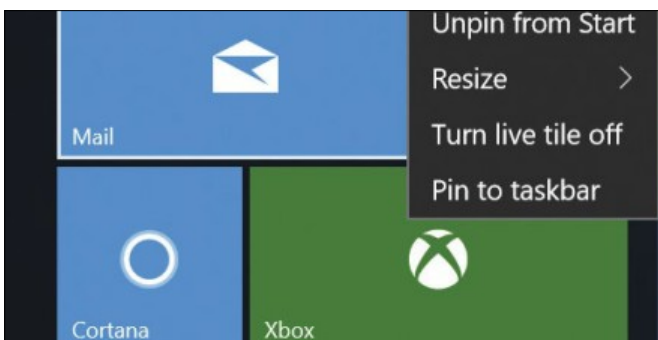
DIM THE SCREEN

The Action Centre on any battery-powered Windows 10 device contains a button that allows you to set your screen brightness. Dropping it to 50% can dramatically improve battery life. If your device comes with a light sensor, an Automatic option will be available, which adjusts the setting based on your surroundings: it will use full brightness only when in direct sunlight.



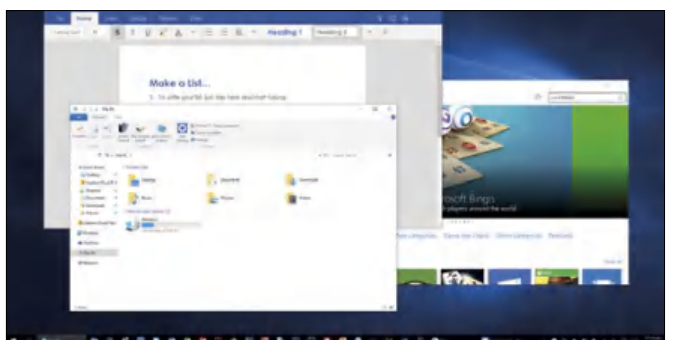
MANAGE BATTERY-SAVER MODE AND BACKGROUND APPS

The battery-saver mode reduces internet and hard disk usage when your battery drops below 20%. You can control it from the Settings app – the "Battery use" link shows you the most power-hungry apps on your system. Click the "Change background app" link to choose which Store apps run in the background.



DISABLE LIVE TILES

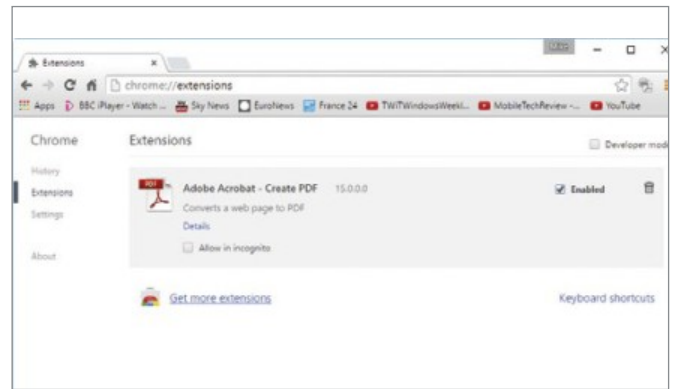
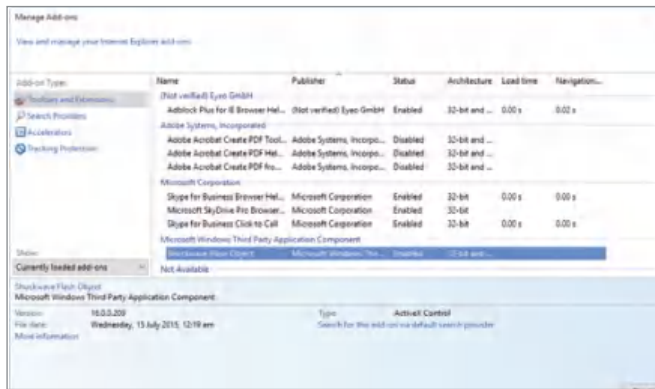
It's a good idea to turn off any Live Tiles you're not using in the Start menu. You can do this by right-clicking each one, as shown above, and selecting "Turn live tile off" from the menu. Although Tiles use only a small amount of power, it's still worth doing. Ideally, you should disable all Live Tiles: when they're active, Windows 10 occasionally resumes from sleep so they can be updated.



RUN APPS IN FULL-SCREEN MODE

If you have an app running in a window on the desktop, you're consuming more power than if you were running a single app full-screen. That's because the GPU has to work harder to keep the screen updated. You can save power on your PC by running apps in full-screen mode and switching between them as needed.

Disable web extensions and browse more efficiently



Surfing the web may seem like a fairly simple task – after all, it's just looking at pages, right? – but it can place a heavy load on your battery. Google Chrome, in particular, is a notorious power-hog: running every tab as an independent process is great for stability, but terribly inefficient when it comes to computing resources.

One way to reduce the load is to disable extensions you're not actively using. Microsoft Edge has an advantage here, since it doesn't support extensions at all in its current form – although that capability is coming. It's also a Store app, which means it automatically suspends itself when not in focus.

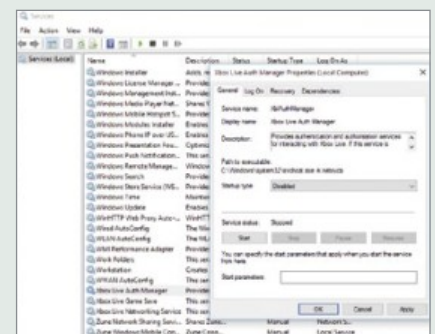
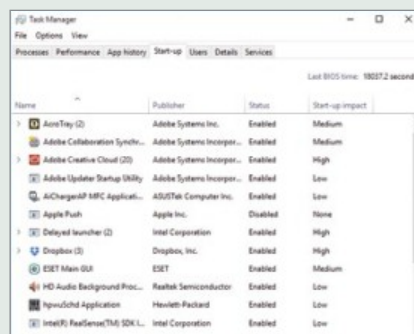
If you're using Internet Explorer, you can disable extensions

by clicking Settings and then "Manage add-ons". Click the add-on you don't want running and then click the Disable button to the bottom-right of the add-ons window. In Chrome, open

Settings, then click Extensions in the left panel. Each running extension will have a Disable link to its right. In Firefox, click the application menu at the top-right of the program window and select Add-Ons. Firefox divides these into Extensions, Appearance, Plugins and Services: click each tab in turn, on the left-hand side of the page, to review what's installed, and change the dropdown to "Ask to Activate" for any plugins you don't want to start automatically.

THE STARTUP ITEMS AND SERVICES YOU DON'T NEED

You might be surprised by the number of apps that start up automatically when your PC boots. The culprits can include "Helper Utilities" from Apple, Google and Adobe, as well as bloatware items that come preinstalled on a new PC. These background programs may not individually consume much power, but having lots of them running at once will inevitably take its toll. In Windows 10 (and Windows 8), you can disable unwanted startup items in the Task Manager. Here's how:



1 Open the Task Manager by pressing Shift+Ctrl+Escape – or right-click a blank area of the Taskbar and select Task Manager from the menu that appears.

2 If you don't see a series of tabs along the top of the Task Manager window, click the "More details" button in the bottom left to make it visible.

3 Select the Startup tab: you'll now see a long list of startup items, along with a "Start-up impact" rating for each one. Items rated "High" hog your CPU and hard disk when they start up, but that doesn't necessarily translate to battery life: any process can wear down your battery by constantly grinding away in the background.

4 To disable a startup app, click its name to select it, then click the Disable button in the bottom-right of the Task Manager window. Be bold: it's extremely rare that disabling a startup item will cause a program to stop working, and you can always re-enable things later if necessary.

It isn't only third-party applications that run at startup: Windows itself loads up dozens of background services, not all of which you need. Again, disabling these easy:

1 Search for services.

2 Right-click a service you want to disable and select Properties.

3 Change its "Startup type" to Disabled.

Of course, disabling services can cause Windows features to stop working: on a work PC, it might be a bad idea to disable the BitLocker or Remote Desktop services. On a personal laptop or tablet, however, you might choose to do just that.

Other services you may want to disable include the Windows HomeGroup Listener and Provider services; the Encrypting File System; bluetooth hands-free and support services; the file history; geolocation; Hyper-V; storage spaces; sensor services and the various Xbox services.

If you're unsure about disabling a service, try setting its startup type to Manual. This means it won't be started automatically when Windows boots.

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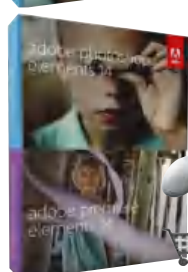
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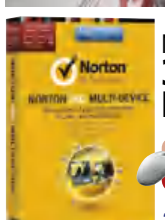


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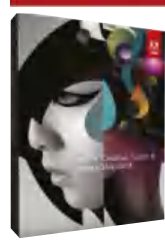
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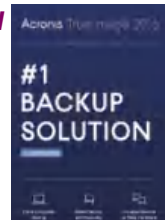
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ESPORTS: TAKING GAMING SERIOUSLY

A trend towards dedicated gaming arenas in London highlights the growth in competitive gaming. **Nicole Kobie** enters the world of eSports

Million-dollar prizes. Millions of fans. Live commentary. Doping. You know a sport's entered the mainstream when it starts ticking off these achievements. Even if, arguably, it's not a sport at all.

eSports are tournaments for console and computer games, shifting the thumb-numbing activity from the living room to an arena. This year saw the first dedicated eSports stadium built in the UK. Based in a Vue cinema in Fulham, London, the Gfinity Arena is a four-screen cinema, with one of its screens dedicated to an event that now attracts hundreds of spectators.

Research from analyst firm SuperData suggests there are 134 million eSports viewers around the world – and that's doubled in the past year. The market's worth \$72 million in Europe and \$143 million in the US, though Asia dominates at \$374 million, led by Korea and China.

The day we attended, during the \$14,000 Play Like A Legend FIFA 2015 tournament, it wasn't difficult to find a seat – despite the finals being touted as a “match of titanic proportions” by a commentary team featuring two former champions. That's right: not only do people pay \$20 for a ticket to watch others play console games, but there's a commentary team, instant replays,

reaction shots of players' faces when they concede a goal, and even post-match interviews.

Despite these trimmings, FIFA isn't the most popular game, as Call of Duty, DotA, League of Legends, Hearthstone and Counter-Strike are all much bigger draws.

PLAYING THE GAME

eSports first started in the late 1990s, said James Dean, managing director at ESL, one of the original eSports organising bodies: “In its very basic form, it started with casual groups of friends challenging each other for pride or a token wager, much like many traditional sports. Over time, the stakes became higher, and eventually professional tournaments started to appear.”

Like other sports, the number of fans watching is greater than the capacity of the stadiums. ESL's Counter-Strike: Global Offensive event in Germany in August had 11,000 visitors each day, but topped 27 million unique viewers online. “What was once a small, tight-knit community of dedicated gamers has dramatically changed over the past ten years,” said Dean. “Some of our biggest tournaments, such as ESL One and IEM, are regularly attracting millions of unique viewers over the course of a weekend, and it keeps growing year upon year.”

“We have recently established an industry-leading anti-doping policy to protect both teams and players”

Consequently, Dean argued that eSports can already be considered a mainstream pursuit, with figures “rivalling the viewership of several mainstream sports”. A report from analysts Newzoo claimed eSports is on a par with ice hockey, with gaming competitions boasting 89 million fans last year versus 94 million for the winter sport. And hockey isn't doubling its fan base annually. “As soon as the current demographics mature we should hopefully witness greater acceptance across the board,” Dean added. “We just need to melt away the stereotypes.”

DEMOGRAPHIC SPLIT

Gaming is hugely popular around the world across many platforms, predominantly onsoles, computers or smartphones. It may come as a surprise that gaming is a few percentage points more popular among women than men. But,

when it comes to competitions, female players are rare – not a single woman competed at the Gfinity event we attended. Women were in the audience, but make up only 18% of attendees, according to an Eventbrite report.

ESL hopes that changes. “Attitudes are rapidly changing, which is really helping to stimulate growth,” said Dean. “The traditional gamer stereotype is slowly dissolving, leading to better gender representation both in tournaments and within the millions that watch both online and offline.”

Dean argued that the power of eSports is that anyone can play. “It gives individuals with limited lifestyles a chance to compete within virtual arenas, and gives those infused with the competitive spirit an avenue to excel,” he said. “There are no real barriers to entry, that’s the real appeal. We see both males and females taking part, with many teams having players ranging from 16 to 32 years of age. It’s an inclusive experience.”

DOPING SCANDAL

With mainstream success comes mainstream challenges. This summer, leading professional gamer Kory Friesen admitted that his entire team took the drug Adderall while competing in an ESL Counter Strike: Global Offensive tournament. He suggested his team wasn’t the only one using the amphetamine, saying on YouTube that “everyone does Adderall”.

ESL disputes this. The organisation tested players at a recent tournament, but didn’t find a single case of doping. “Although we are yet to find any proof of substance abuse within any of our competitions, we have recently established an industry-leading anti-doping policy to protect both teams and players,” said Dean.

✓ Fans pay to watch eSports live, but most of the viewership is online



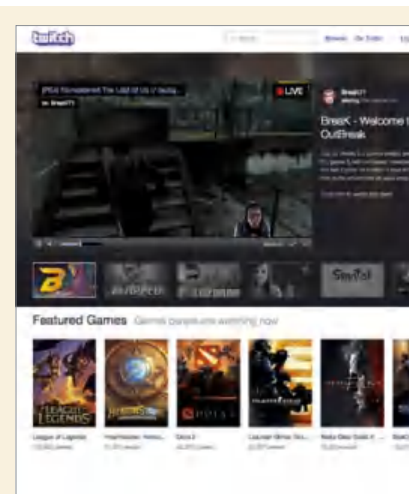
▲ A big draw of eSports is its inclusivity – anyone can enter online

WANT TO PLAY?

Adderall aside, what does it take to play professionally? Anyone can enter the online tournaments, but you have to be good to advance. We asked Frenchman Brian Savary – better known as “Vitality Brian” – what it takes: “I started at the beginning of FIFA 2014, so I’ve played for two years,” he said. He reached the final in his first big tournament. “After that, I was like ‘whoa – I can do this’. So I continued and I’ve won Gfinity [tournaments] two times since.”

Savary was one of the favourites going into the tournament, although commentators expressed concern he hadn’t been playing enough. “We have to practice a lot each day. For FIFA... maybe five games each day. For this [tournament], I couldn’t because I have summer work near my parents’ house, and they haven’t got an Xbox so I haven’t trained a lot. Not at all, really.” The pundits were right: Savary placed second to another favourite, Spencer “xL HugeGorilla” Ealing, who took home \$7,000.

Why choose FIFA and not more popular competitions? “I’ve played football in real life since I was four,” he said. “I’m not bad at [real] football, I play in the seventh league in France, but I think I’m better at FIFA.” ●



TWITCH VS YOUTUBE

Gaming fans don’t only watch their favourite players at live tournaments in glitzy stadiums. Live streaming video of gameplay has become incredibly popular. Leading site twitch.tv boasts 100 million visitors a month, has 1.5 million broadcasters, and reportedly constitutes as much as 44% of US streaming traffic.

All of that is fairly remarkable given its humble origins. Remember justin.tv? The streaming site started in 2007 with a single feed of founder Justin Kan’s life. Naturally, that didn’t last very long, and the technology behind it eventually led to twitch.tv, which lets gamers watch each other play and live stream eSports events.

Last September, Amazon decided the site was worth a sum in the region of almost a billion dollars. Google was also rumoured to be considering buying Twitch, but instead responded with a new YouTube site built purely around gaming. YouTube Gaming is based on the existing platform, but will sit separately – as Google notes, you can, for instance, type “call” into the search, and it will know that you want Call of Duty and not the song “Call Me Maybe”.

Forbes revealed that Jeffrey Shih, a Hearthstone livestreamer, commands up to 20,000 viewers per night, making thousands of dollars a year from the ads that sit beside his videos – and that’s before the money that comes from sponsorship deals. Who said gaming all day was a waste of time?





MYO: MAKING GESTURE RECOGNITION WORK

Thalmic Labs wants to make gesture recognition more functional and less intrusive. We spoke to CEO Stephen Lake about the company's first product Myo armband, which uses EMG sensors on your arms to detect hand mover

Interacting with smart devices can be challenging, and often involves furious hand-waving at a camera or talking to smartglasses. Now, Thalmic Labs' Myo promises to reduce such sweeping movements down to simply tapping your fingers together.

The Myo armband measures forearm muscle movements for gesture recognition. The system lets you tap your fingers to move a presentation forward, skip songs on your smartphone and take snaps with a GoPro camera. You can even use your hand as a game controller.

Thalmic Labs' trio of co-founders met at the University of Waterloo, Canada, as students. We spoke to co-founder and CEO Stephen Lake.

How did the idea for the Myo come about?

We started working on this in 2012, with the idea of how to build a mouse for the next generation of computers. It wasn't about replacing the mice and keyboards of today, but more for when we have smartglasses, virtual reality, or wearable displays. How do we interact with those?

People have tried various things – the first Google Glass used voice control. Even if it works properly, you have the social stigma of being the woman wearing funny glasses and talking to herself on the Tube.

How does this differ from other gesture-control systems?

Other people have tried gesture control before, but using cameras – such as Microsoft's Kinect. But it's limited, because you have to be in front of

the camera, so it only works in specific situations – in your living room in front of the TV, for example. It doesn't work in the world. We wanted something that would work anywhere.

We started with how to detect the hands. We've evolved to use our hands for everything – our instinct is to do things and gesticulate. We didn't want to have a glove or interface getting in the way. It was something that would fade into the background and make the technology seamlessly blend with the world around you.

How does Myo achieve that?

It's based on medical tech called electromyography (EMG). The Myo works by sending electrical activity from your muscles to sensors that pick up the forearm muscle activations. When you make a fist or wave your finger, for example, you activate groups of muscles.

We detect the different patterns and muscles that you're using – and pick up a tiny electrical voltage. It's not picking up pressure, movement or anything like that, as it is purely electrical.

There are eight sensors in total, with an ARM processor and Bluetooth chip in the master pod. There is also a gyroscope and an accelerometer for the motion tracking.



▲ The master pod has eight sensors that pick up electrical waves

Can it fit different-sized arms, or those who are hairier than normal?

Larger arms, smaller arms – we spent a lot of time figuring that out. Your arm may have less hair or more hair than someone else's, a different muscle mass – this was actually one of the hardest parts, trying to account for such variations. But we've been able to develop both the sensors and the software in such a way that it calibrates away any difference in each person.

What applications are there for businesses?

A partner of ours, based in Spain, has built a software solution for surgeons in the operating theatre. They integrated Myo to let them zoom through and view different slices of MRI scans, touch-free. The surgeons are scrubbed up, so they can't touch a computer.

There are also applications in the field of industrial robotics. For example, in one case the Myo is being used to actually program and control robotic arms in a manufacturing plant for automobiles.



- ▲ No matter how hairy your arm, the Myo smart armband should just work
- > You can tap your fingers together to move a presentation forward



UNVEILED: CANON'S 250-MEGAPIXEL CAMERA SENSOR



Want to read the lettering on a plane from the ground? It's possible with this sensor

The first generation of digital cameras sparked a race for more megapixels – Kodak's debut model had a mere 1.3-megapixel sensor.

How times have changed. While modern DSLRs such as Canon's own EOS 760D will have around 24 megapixels, and upper-end models will top 50 megapixels, the company has unveiled a prototype camera with 250 megapixels, stuffed into a CMOS sensor smaller than a standard 35mm full-frame sensor.

What can you do with such a ridiculous level of detail? Canon said that the sensor, when installed in an unnamed camera, could distinguish the lettering on the side of an aeroplane from 18km away. Plane spotters and spies rejoice – celebrities and other targets, it's time to panic. Canon suggested it could also be used for surveillance, high-res measuring instruments and “the field of visual expression”.

While it sounds unlikely that the 250-megapixel camera will hit even professional camera models in the near future, Canon did say it's working on a DSLR with a 120-megapixel sensor – though it didn't say when it would be available. Either way, you're going to need one heck of an SD card to hold those images.



- The CMOS sensor is APS-H size, which sits between the APS-C consumer level and professional full-frame sensors.
- The sensor measures only 29.2 x 20.2mm, but crams in 19,580 x 12,600 pixels.
- The high pixel counts mean slower read times, but Canon said its sensor boasts an “ultra-high” signal read-out speed of 1.25 billion pixels per second thanks to circuit miniaturisation.
- It can capture video at 5fps, with a resolution 30 times that of 4K.
- The sensor is small enough to fit inside a DSLR, such as this prototype, but Canon say it's more likely to find a home in professional imaging equipment.

CROWDFUND THIS! SEE SENSE ICON CONNECTED BIKE LIGHT

Our pick of tech projects on Kickstarter and Indiegogo

Why would a bike light need to be connected?

Because these days, we connect everything. But there are benefits beyond turning your lights on and off with a smartphone – which is one of the features, naturally. For example, you can adjust the brightness to extend the runtime of the lights if you're running low on battery power. And ICON isn't just a smart light, it makes your bike smart, too. For example, it sends a notification to your smartphone if someone is meddling with your bike, and pings an alert with your location if it senses you've been involved in an accident.

Sounds like a bright idea. Is that the best you can do?

Anyway, it's even smarter than that, for this is a truly “intelligent” bike light. That means it has sensors built in that judge the road conditions, and tweak the light in response. If it becomes darker, the light gets brighter; come up to a junction, and the light can flash more quickly to make you more visible to cars. Plus, new features will be added with ongoing Bluetooth firmware updates.



Can it track location and speed?

The app doesn't support the sort of tracking that bike computers perform, but the data appears to be available. Indeed, the Belfast developers suggested the aggregated data from the ICON lights can be used by councils to help design smarter cities, tracking routes taken, crashes, road surface conditions and more. If you don't want your data collected, you can opt out.

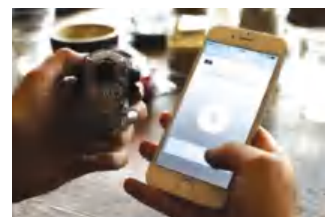
What about the lights themselves?

Average cyclists should only need to charge the ICON lights once a week, with a five-hour charge lasting for 15 hours of road time. It uses dual LEDs that are bright enough to be seen in daylight and features side illumination, boosted with a lens to help increase visibility from every angle. Handily for British cyclists, it's waterproof.

Will this get backed?

It already has. At the time of writing, See Sense had exceeded its \$50,000 goal by more than half, well ahead of the 24 October deadline. A set of front and rear lights costs \$190, with shipping expected to start in January. For an extra \$40, you'll get an even brighter version.

SEE.SENSE® ICON



HYPER»

101

GAMES

You Must Play

OUT
OCT
15





HEY SIRI, WHO'S SMARTER THAN YOU?

Smartphone helpers are only the first generation of digital assistants, with new developments offering major improvements for businesses and consumers

Siri, Google Now, Cortana – whatever your smartphone OS, you have access to a smart assistant. But they're only the beginning, as virtual helpers are moving off the smartphone.

"[Virtual assistants] are not destined to sit in a phone like some kind of mega-watt app," said Dr Chris Brauer, director of innovation at Goldsmiths. "The greatest utility will come as they interact across domains – in your car, on your watch, on your TV, and in your home."

Virtual assistants (VAs) are already expanding: Amazon's Echo sits in your living room, ready to answer any question you ask, while Siri is built into the newly announced Apple TV.

At the moment, most virtual assistants are limited in what they can understand. Give Siri an easy question and it excels, but ask for anything other than basic facts and it stumbles.

This is why Facebook M is using human helpers to augment its answers. "VAs are learning machines, individually and

collectively, so for the time being it makes sense for humans to 'coach' VAs for improving functionality and services," said Dr Brauer. "In the near future, it will probably invert and it will be predominantly VAs coaching humans for improved decision-making and rationality."

NEXT-GEN HELPERS

Some virtual assistants are already beginning to handle complex queries, with Viv Labs' assistant being able to tie ideas together: ask for a wine that goes well with fish to buy on the way home, and it will know your route, recommending a shop and bottle. SoundHound's Hound can run equally complex searches: ask it to book a hotel in Brisbane with free Wi-Fi for less than \$200, and it will suggest a selection.

More research will allow voice assistants to better understand our natural speech patterns and consider multiple questions at once. "It's a perfect storm of research and investment in deep learning, voice recognition, neural networks, language processing,



> Amazon's Echo is just the start



▲ Digital assistants are starting to move off smartphones and tablets

and techniques such as 'reinforcement learning', which helps machines observe experiences," said Dr Brauer.

BUSINESS ASSISTANTS

The potential for virtual assistants is huge in the private sector: "Innovations and applications behind the corporate or industrial curtain are having the most immediate impact," said Brauer.

IBM bought virtual assistant Cognia to work with AI supercomputer Watson, while IPSoft's Amelia AI helper can respond to customer service requests using natural language.

The inevitable downside: these digital helpers may eventually end up putting humans out of call centre jobs in the same way robots have made production line workers redundant.

FUNKY SCIENCE

HEARTS REANIMATED FOR TRANSPLANTS

The waiting time for a new heart is up to two years in Australia, partly because hearts for transplant must be harvested while the donor is still alive – so they're only taken from brain-dead patients. However, TransMedics may have solved that problem: its organ care system "reanimates" recently dead hearts by pumping in blood and oxygen so they can be used for transplants. So far, it's been used successfully 15 times in the UK and Australia.



CONTROL YOUR SMARTWATCH FROM A "TATTOO"

Forget trying to control your wearable via its tiny screen – now you can install a connected tattoo onto your own skin. Created by Saarland University and the Max Planck Institute for Informatics, iSkin is a silicon rubber tattoo with pressure-sensitive sensors that can be attached to any part of your skin. You can tap it to answer calls, play music and even type messages. iSkin requires a wired connection, but the developers are hoping to use wireless chips.



SPACED-OUT BROADBAND

A paper written by Samsung Research America president, Farooq Khan, has suggested building a network of 4,600 microsatellites in low orbit around Earth, in order to offer truly global internet access.

Each satellite would sit 930 miles above the planet and transmit terabytes of data per second, helping to reduce the burden on wired networks. Google, Elon Musk's SpaceX and Virgin are all considering the idea and talk of collaboration to achieve this goal is underway.



DVD CONTENTS

Apps, essentials, full software, drivers & more!

FEATURES

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STUDIO 2015 + ABILITY OFFICE V6 +
AUTOBACKUP 4 + HDR PROJECTS 2
+ SSD FRESH 2015

DRIVERS

+ ATI CATALYST + NVIDIA FORCEWARE

HELP

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+ MALWAREBYTES' A/M + SANDBOXIE
+ VLC MEDIA PLAYER + FLUX + 7ZIP

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APPLE ITUNES + DROPBOX + FLUX +
GOOGLE CHROME + MOZILLA FIREFOX
+ PLEX + SKYPE + TEAMVIEWER + VLC

INTERNET

+ VUZE + DROPBOX + GOOGLE
CHROME + MOZILLA FIREFOX +
MOZILLA THUNDERBIRD + SKYPE +
STEAM

LINUX

+ RASPBIAN

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Highway, St Leonards NSW 2065

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accept any responsibility for any loss, damage or disruption to your data
or computer system that may occur while using the discs, the programs
or the data on them. There are no explicit or implied warranties for any
of the software products on the discs. Use of these discs is strictly at
your own risk.

FULL VERSION

ASHAMPOO SLIDESHOW STUDIO 2015

Finding new and interesting ways to
show off your photos can be difficult, but
Ashampoo Slideshow Studio gives you a
range of new and exciting options.

From start to finish you are guided
through every step of the slideshow
creation process. It does not matter
whether you are a complete novice, you
will still be able to produce something that
is going to turn heads. You can tailor your
slideshow for playback on widescreen or
4:3 ratio displays and the first thing you
will need to do is select the images you
would like to include.

REGISTRATION & INSTALLATION:

- Download and run ashampoo_
slideshow_studio_2015_20583.exe
- After you launch the software, a prompt
will appear requesting you to register.
- Click on "Get free activation key", this will
open up a link in your default internet
browser.
- Enter your email and hit the "Request full
version key".

NOTE: Users who have previously
registered an Ashampoo product, please
log in.

Once you have logged in, go back to within
the application and click "Request FREE
full version key" again and fill out the
prompts accordingly.

Copy and paste your license key into the
application, press next and complete the
installation process.

Congratulations! You have unlocked

Ashampoo Slideshow Studio 2015

For support of this software, please direct
your queries to: <https://www.ashampoo.com/en/aud/sup>

REQUIREMENTS:

- Windows XP, Vista, Windows 7, or
Windows 8
- 50 MB hard drive space

LIMITATIONS:

- Registration Required.
<http://www.ashampoo.com/>

FULL VERSION

ABILITY OFFICE V6

Ability Office is a powerful Office-
compatible productivity suite, including
a word processor, spreadsheet,
presentation tool and photo manager.

The suite's editor, Ability Write, looks
and feels a lot like Microsoft Word. It reads

and writes the same .DOC and .DOCX
files, supports all the formatting options
you need, includes vector drawing and
autoshape tools, has indexing, TOC, spell
and grammar checking, and can optionally
export your finished documents as PDF.

REGISTRATION & INSTALLATION:

- Download and install Ability-Office-v6-
Setup.exe
- Start and complete the installation
process.
- To register for your serial, point your
browser to <http://ability.disc.pcauthority.com.au/>
- Log in or create an account.
- Once you are logged in, scroll down the
product page and click on the "Get Serial
Code" button. This will display your serial
key.
- After the installation process has
completed, run the software and you will
see a "Activate Now" at the bottom of the
user interface. Click "Enter License".
- For support of this software, please
direct your queries to: <http://www.ability.com/support/index.php?ln=en>

UPGRADE OFFER:

We've given you a single activation, one
PC licence for Ability Office v6 Standard.
The Professional edition offers far more
functionality, including Database, which
you can use to catalogue data and
Photopaint, which is a fully-featured photo
editor. Better still, you can upgrade to a
multi-seat licence, enabling you to install
across more than one PC.

Ability is offering PC & Tech Authority
readers 50% off all versions of Ability
Office, including multi-seat editions. To
obtain your 50% discount, head to the
Ability Store, then enter coupon code
W42Q4ZR during the checkout process.
Valid to December 31st 2015.

REQUIREMENTS:

- Windows XP, Vista, 7, 8 or 10
- 150 MB hard drive space

LIMITATIONS:

- Registration Required
<http://www.ability.com/>

FULL VERSION

AUTOBACKUP 4

Removable media is now a great deal
cheaper than it used to be, and many
computer owners will possess a USB
drive of some form or another. While

these can be used to transport files from one computer to another, they are also perfect for backing up data. This can be done manually if you have the time, but by turning to O&O AutoBackup you can automate the process and make your life a great deal easier.

REGISTRATION & INSTALLATION:

- Start and complete the installation process.
- For 64bit users, please download and install OOAutoBackup464Enu.exe
- To register for your serial, point your browser to <http://autobackup4.disc.pcauthority.com.au/Log in or create an account>.
- Once you are logged in, scroll down the product page and click on the "Get Serial Code" button. This will display your serial key.
- After the installation process has completed, you will be prompted to enter your serial key. Paste the serial key and complete the registration process.
- For support of this software, please direct your queries to: <http://www.oo-software.com/en/support>

REQUIREMENTS:

- Windows XP, Vista, Windows 7, or Windows 8
- 40 MB hard drive space

LIMITATIONS:

- Registration Required
- <http://www.oo-software.com/en/>

FULL VERSION

HDR PROJECTS 2

High Dynamic Range imaging (HDR) is a smart technology for producing crisper, cleaner, more detailed digital images.

Instead of taking a single image of a scene, HDR typically involves blending several pictures, each with slightly varying exposure settings, which means you're able to capture and preserve information which would otherwise be lost.

HDR projects 2 is a powerful application which helps you create the best possible HDR images.

REGISTRATION & INSTALLATION:

- Note: Please be aware that the registration process may not be instant. During our testing, we had to wait a few minutes before receiving relevant emails.
 - Download and install HDR-projects-2-win-uk-PC-Pro.exe
 - Follow the instructions from within the setup. This will require you to fill out their online form.
- Once you receive the confirmation email, click on the confirmation link. This will send you another email.
- The final email will contain all the details necessary to complete the installation

process. Copy and paste accordingly.

- For support of this software, please direct your queries to: <http://www.projects-software.com/contact/>

UPGRADE OFFER:

HDR projects 3 is the brand new version. In addition to being Windows 10 compatible, a complete RAW module enables you to work with RAW photos, an improved removal tool enables you to make on-the-spot adjustments, you get a fine colour adjustment tool and much more. Best of all, HDR project 2 users can upgrade for only for off the RRP. To upgrade, head to <http://www.projects-software.com/hdrprojects-3-upgradecm/>

REQUIREMENTS:

- Windows XP, Vista, Windows 7, or Windows 8
- 200 MB hard drive space

LIMITATIONS:

Registration Required
<http://www.projects-software.com/>

FULL VERSION

SSD FRESH 2015

SSD Fresh 2015 is a simple tool which can help to extend the life of an SSD (Solid State Drive).

Launch the program and it displays an overview of your system drives, including the drive model, name, capacity, number of partitions, file system, free and used drive space.

The real value of SSD Fresh 2015 comes its "Optimization" pane, though, where

the program gives easy access to a host of low-level settings which could affect your SSD's life and performance.

REGISTRATION & INSTALLATION:

- Download and install ssdfresh_uk_02_2015.exe
- Register your details within the program. *NOTE* if you've previously registered any Abelssoft full product, you won't need to register again.
- You should receive an email from the software vendor, click on the activation link and the setup will complete.
- For support of this software, please direct your queries to: <http://www.abelssoft.net/contact>

REQUIREMENTS:

- Windows XP, Vista, Windows 7, or Windows 8
- 20 MB hard drive space

LIMITATIONS:

Registration Required
<http://www.abelssoft.net>

FREE FULL VERSIONS: Each month, we offer *PC & Tech Authority* readers full registrable versions of some software on the DVD. See the installation instructions in the DVD menu to complete registration, if applicable. **IMPORTANT:** Full product registration closes on 07/12/15



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FEATURE + ABILITY OFFICE V6 + AUTOBACKUP 4 + HDR PROJECTS 2 + SSD FRESH 2015 + ASHAMPOO SLIDESHOW STUDIO 2015 **DRIVERS** + ATI CATALYST + NVIDIA FORCEWARE **HELP** + DISCLAIMER + DAMAGED OR FAULTY DVDS + USING THIS DVD + INSTALLING SOFTWARE **EDITORIAL** + BURNING AN ISO IMAGE + PC&TA EDITORIALS **TROUBLESHOOTING** + SERIAL CODES + BLANK REGISTRATION WEBSITE + CAN'T FIND A FILE? + INSTALLATION ERROR **WINDOWS** + CCLEANER + CLASSIC SHELL + CUTEPDF + DEFRAGGLER + FOXIT READER + GREENSHOT + APPLE ITUNES + LIBRE OFFICE + OPEN OFFICE + MALWAREBYTES' A/M + SANDBOXIE + VLC MEDIA PLAYER + FLUX + 7ZIP **MAC** + ALFRED + BETTERTOUCHTOOLS + APPLE ITUNES + DROPBOX + FLUX + GOOGLE CHROME + MOZILLA FIREFOX + PLEX + SKYPE + TEAMVIEWER + VLC **INTERNET** + VUZE + DROPBOX + GOOGLE CHROME + MOZILLA FIREFOX + MOZILLA THUNDERBIRD + SKYPE + STEAM **LINUX** + CLONEZILLA LINUX

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Make sure to include your name and postal address on the back of the package so that we know where to send the replacements. For all other DVD related issues email cd@pcauthority.com.au. As the delivery platform only, PC&TA and Haymarket Media cannot and will not provide support for any of the software or data contained on these discs. Although all discs are virus scanned, Haymarket Media cannot accept any responsibility for any loss, damage or disruption to your data or computer system that may occur while using the discs, the programs or the data on them. There are no explicit or implied warranties for any of the software products on the discs. Use of these discs is strictly at your own risk.



JON HONEYBALL

"WE CAN REDUCE OUR ONLINE FOOTPRINT, BUT DELETING OLD TWEETS AND PICTURES FROM FACEBOOK WON'T SCARE OFF A SPOOK"

The bottom line is that I trust Microsoft sufficiently to not be concerned about what it's doing with Windows 10, and you shouldn't be either

So Windows 10 has been out in the wild for a while now, and we've already been flooded with updates and fixes. It's clear that a lot of things have needed attention and tweaks, together with the inevitable adjustments. And now the merry-go-round has started up again, with fast-track "Insider" builds starting to roll out for those who want to live at the bleeding edge of the build cycle. So, how well did Windows 10 land? I think that it's in pretty good shape, barring a few fit-and-finish issues.

Upgrading people's machines has proven a bit of a bumpy ride, and I've had to take several machines back onto Windows 7. It appears that the 8.1 to 10 upgrade might have gone more smoothly, and perhaps there's a logical reason for that, given that 8.1 is "closer" to 10 than 7 (I'm not getting into numerology, but talking about their underlying codebases). I've had some problems with devices that dock and undock a tablet component from their keyboards, but that's exactly the sort of device-specific problem that is inevitable for a new OS build, and one that will be ironed out in time. I've also seen some very strange issues related to screen resolution when running various hypervisors, (especially if you exacerbate the problem by running on a high-DPI screen at the same time). However, a new version of Fusion appears to have fixed much of this.

Is there any reason not to upgrade? Well, let's talk about those privacy issues. There's been something of a storm over reporting this matter, with claims that Microsoft continues to snoop after you've told Cortana to go boil its head, that your information still ends up in its data

centres, and that you have no control over any of this. My answer to these allegations is simple – get over it! While I absolutely do not subscribe to Google's view that privacy is now passé, if you're going to use any platform with services tied to cloud engines – whether that be for voice recognition, web searching, data storage, or processing and storing of your photos – then there has to be some privacy trade-off. You cannot keep everything local and still have it processed remotely, and you cannot share stuff between your various devices without creating a pathway between them. Therefore, the real issue is whether or not Microsoft is trustworthy:

"It's clear that Microsoft is making loud and sincere calls about cloud privacy today"

answer that and everything else will fall into place.

I would like to say that Microsoft can be trusted and that it's not an issue, but it's not quite that simple.

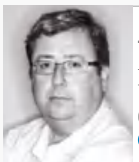
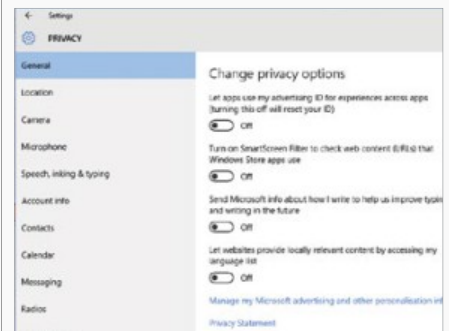
Long-term readers may remember my evisceration of Microsoft and its lawyers over the Patriot Act issues that affected its cloud servers – the way it could move your data between territories at the command of the US government. I could point out that there's still an ongoing court case covering this issue between the US government and Microsoft. I could go even further and say that, back then, Microsoft's lawyers were plain naive in promising that everything would be fine. And I could go even further than that, but I'd be taken to Guantanamo Bay and never heard of again.

No matter, because it's clear today that Microsoft is making loud and sincere noises about cloud privacy, as indeed it should. But don't be fooled into thinking this change of heart came about after

it woke up one morning and decided that data privacy is suddenly a big moral issue. The reality is that Microsoft woke up and decided that it's a big business issue, since a public panic over privacy is likely to throw a spanner into its business plans for global data-centre domination. Even so, the reality remains that, if you want to live in a connected space, you need cloud services, and these need to be hosted somewhere by someone. You can do this yourself, if you really want, but the hardware cost and software complications will be significant. The bottom line is that I trust Microsoft sufficiently to not be concerned about what it's doing with Windows 10, and I don't think you should be either.

If you think this is simply not good enough, that's your prerogative, but please don't stay on an old version of XP that's corroding away day by day. At least move up to a modern open-source operating system such as Linux Mint, and do the job properly. It really is your choice. What's more, given the personal data that people will happily hand over to leaky websites such as a certain secretive dating site, knowing how much toilet roll I buy from Tesco or where my friends are meeting for a pint is hardly going to interest either the Microsoft or NSA spooks. This is not, in any way, me being

✓ Windows 10 offers privacy options to protect your data



JON HONEYBALL

Jon is the MD of an IT consultancy that specialises in testing and deploying hardware
@jonhoneyball

complacent, and I stress that real secrets must be handled appropriately – but the detritus of everyday life isn't something that particularly bothers me. If it does you, do something proactive about it. We can massively reduce our online digital footprint if we wish to do so, but deleting old tweets and pictures from Facebook won't scare off any serious spook in any country.

LINN ROOM CORRECTION

Sometimes you come across a new technology that really makes you go "oooooh!", and I've recently found one from Linn Products. Famed for its high-end hi-fi equipment, this is a company I've been following and supporting for decades. Those with very long memories might recall articles by our very own Dick Pountain (in the now-defunct Byte magazine) that covered Linn's object-based operating system, which ran the robots in its then-futuristic factory – 30 years ago. This, therefore, is not a company that's scared to push the boundaries of technology.

The problems in reproducing high-quality music in small rooms all stem from the fact that we still don't really have a clue how human hearing works. At the end of the day, the human ear is a deeply non-linear transducer that is connected to a soft, grey supercomputer with powers we can only begin to imagine. Technical test equipment – even the very best – simply isn't good enough to scratch the surface of the way a human being hears and responds to music. Had I thought 30 years ago, when I started in the field of audio analysis, that this would remain the case today, I'd probably have been very upset that so little real progress would be made during my lifetime. Nevertheless, there are some areas where significant steps have been made, and Linn has made one with its new DSP code.

Called Space Optimisation, this system lets you define the shape and size of your listening room: where the walls are, what material they're made of, and the location of the windows and doors. You then work out the ideal position for the speakers using some clever algorithms – but that's only the start. You tell the software where the speakers actually need to be placed (to pacify other members of the household, like the all-important wife/husband/children, and so forth). The system calculates the transforms that need to be applied to the sound stream to permit you to place the speakers in these highly non-ideal positions, yet still hear a high-quality result wherever you sit down.

To achieve this, it calculates the synthetic performance of the room: where its low-frequency resonance



< I tried the Linn Sneaky DSM player in several challenging rooms – and it was up to the task

Processing out the DSP code and then downloading it to the DSP takes but a few seconds.

I think it's great that innovative work is being done in this field, as getting the best sound quality in a domestic environment isn't easy. I'm lucky enough to have a full set of professional recording equipment, and to have access to venues such as Abbey Road. But the problem with audio is that few people actually know what it should sound like – it's ephemeral and not easy to quantify or qualify, even for professionals. Heck, even the task of putting together a taxonomy, let alone a dictionary, of agreed terms is hard enough. Doing room modelling for DSP correction isn't new, but Linn is pushing the boundaries of what can be delivered to real users in their homes, and its efforts should be hugely applauded.

modes are, where the speakers are placed and what is going to happen in that real room. There's a large database of speaker models that Linn has tested, so it knows the performance of this important transducer. This data gets munged and then sent to the DSPs inside the Linn streaming box, and the calculated room correction is applied to the sound you hear. Does it work? Oh yes, and how. This

"This is very impressive DSP coding, clearly a real-world solution to a real-world problem"

is seriously impressive DSP coding, clearly a real-world solution to the real-world problem of where to place speakers in a real lounge – not in the perfect positions that hi-fi buffs espouse, but where they can actually fit.

I was so impressed by a demonstration from Linn's engineer Philip Budd, the brains behind this system, given at a recent open day, that I was tempted to cough up the money for my own Linn Sneaky DSM player. I have tried it in several acoustically challenging rooms, with great success. The control software, which is a free download for Windows and OS X, is easy to use and identifies things such as room resonance modes quite accurately, giving you the tools to fine-tune these to get the best benefit with the minimum overall interference.

VMWARE

The latest version of VMware Fusion has arrived. I can't really find much to say about each new iteration of this tool, simply because it does what it does. Support for Windows 10 has been added, along with OS X 10.11 (at least for the current beta). It does much the same as last year's version, but I get the feeling that this software is effectively turning into an annual subscription. And it's not cheap either: upgrading three licences to Fusion 8 Pro cost me \$180, which is a tidy sum, and I seem to recall paying nearly that for the last version not so long ago.

I can't argue with the value proposition, though – Fusion is a key part of the way I work, on both my desktop and laptop OS X computers. It's my preferred way of running Windows, especially in an



experimental environment, when looking at oddball and weird apps and services. Being able to shut things down, roll back five minutes and restart, all within a few seconds, is an absolutely irreplaceable capability. But Fusion isn't the only game in town in this arena, and it's hard to see much price competition going on between the various vendors. A more friendly upgrade price wouldn't go amiss as a first step.

RETROSPECT

Retrospect backup software continues to impress on the Mac. I use it to back up and archive onto removable drives, and also to the HP LTO-6 robotic library store that we use every day. It's mostly fit-and-forget ,and I should probably move it over to a spare box. In the meantime, I can't think of much wrong with it: it's stable, has good reporting, and works well.

ANKER BATTERY PACK

The "Useful Toy of the Month" award goes to Anker for its monumentally huge Astro E7 USB charging pack, which comes with an eye-watering 25,600mAH battery. It's not a small unit, nor is it particularly light, but it sports three full-power USB sockets and holds more than enough juice to handle nightly recharges on my iPhone 6s and Apple Watch, night after night. I reckon I can get a good working week from this lump, making it something of a game-changer, especially if you're in one of those hotel rooms with power sockets miles away from the bed. It's now a standard item for my backpack that goes with me on every trip. The only downside is its charging time, which can take most of a working day, but you can plan this to take place at the office so that it doesn't get in the way.

DROPBOX ADMIN MODE FOR NO DELETE

Here's a nice new feature in Dropbox – a platform that continues to impress. You can now set it so that only administrators can make hard deletions from the online store, while attempts by ordinary users are ignored. I like this because it brings an extra layer of protection against mistaken deletes, malware and even disgruntled employees. Consider enabling this by default if you run a business account on Dropbox.

> The Anker Astro E7 comes with an eye-watering 25,600mAH battery



MR SNOVER AND MR LOVELL

It's not often that I call someone out by name, but Jeffrey Snover most definitely deserves it (follow him on Twitter at @jsnover). Why the praise? He's the godfather of PowerShell in Windows, which is now the only important administrative interface to Windows for larger organisations and the enterprise world. The GUI has gone, to be replaced by scripts and code. Of course, the GUI is still there really, but it's now a generator of code and consumer of code output. This is all down to Jeffrey and his team, who had the vision to realise that a graphic user interface could only scale so far and would ultimately be the undoing of the larger-scale server platforms.

COOKING THE GUI

Why so? It's because a GUI can't give you all the flexibility that you need. Things change fast, and it's much better to address them through a scalable API than through a GUI that you might have to re-cook every time, to say nothing of the precarious unsuitability of drag-and-drop for handling large amounts of data. In PowerShell, Microsoft has introduced a method by which data centres and server farms can be created, managed and modified in a simple and consistent way, without concern for the size of the system. In September,

^ VMware Fusion is my preferred way of running Windows, especially in an experimental environment

Jeffrey tweeted: "Bad news: I'll never get another promotion. Good news: I've been promoted to technical fellow (there's nothing above that)." In effect, he's reached the top of the tree within Microsoft for a technical god like him, and it's highly deserved. Well done.

Also a shout-out to my good friend Martyn Lovell from the developer group, who's just reached the giddy heights of "Partner" at Microsoft. This is a very high-level position within the development tools group. I've known Martyn, an expat Englishman, for many years, and his knowledge of the development tools process is exceptional. I strongly suggest you attend one of his technical talks, if you get the opportunity.

APPLE IPAD PRO

I'll confess that I'm excited by the forthcoming iPad Pro. I've had large touchscreen devices before – including my 18in Dell which I jokingly call "The Teatray" – but these have suffered both from lack of screen resolution and way too much weight. The iPad Pro might well be a happy compromise between a very high-resolution screen, useful size, low weight and long battery life.

I can't wait to use it in various, admittedly niche, areas such as a touch surface for digital audio workstation editing. You might argue that iPad Pro is overkill for mainstream tablet applications, but its combination of pen and keyboard – both shamelessly pinched from Microsoft's Surface – could make it a killer portable workstation. Let's see what software comes along that's optimised for this new form factor (Microsoft staked an early claim in this area during the keynote). ●

PAUL OCKENDEN

"BE WARNED THAT SCAMMERS NOW APPLY THE TERM 'SMART REPEATER' TO THEIR TOTALLY ILLEGAL KIT"

Like many of the devices in the IT world, data blackspot solutions have become smaller, faster and cheaper

I've just received an email from Amazon, promoting its current "Deal of the Day", which is a SanDisk microSD card. It's not just any microSD card, though, because this one holds 200GB. I'll say that again: 200GB of storage space in a microSD card – one of those ultra-tiny ones, smaller than my little fingernail, and costing a shade over \$200 (until midnight tonight, anyway). I find it utterly mind-boggling that we've got to the point where we can pack so much data into such a tiny package.

TIMES ARE CHANGING

I realise that this will make me sound old, but the first hard drive I ever bought was a 5MB device made by CDC, which was a full-height model with a diameter of 5.25in. For those of you who have never seen a full-height drive, they were around 83mm high, weighed a tonne (not literally), were particularly fragile, power hungry and, by today's standards, terribly slow. I did some "back of a fag packet" (or "sheet in Excel") calculations and worked out that the ancient drive had a storage density of around 2KB/cm³. The SanDisk card offers storage at a density of 1.2TB/cm³, which is around six-hundred million times more dense than my old drive.

PACKING IT IN

These are the kind of numbers we take for granted in the IT world, but sometimes I'll still see something that makes my mind boggle, and the email from everyone's favourite taxpayer was just such a moment. So much storage in such a small package (and for so relatively little money) is simply incredible. In fact, it's given me the theme for this column: faster, smaller and cheaper.

MOBILE NOT-SPOTS REVISITED

A topic that's always proved popular in this column has been help for places where the mobile signal is either weak or non-existent. In the latter case, you need either a femtocell or some kind of Wi-Fi-calling software on your handset, both of which obviously require a reasonably

"I find it utterly mind-boggling that we've got to the point where we can pack so much data into such a tiny package"

good internet connection. However, in places where there's a sniff of signal (and no broadband), another alternative is a mobile signal booster.

Readers with long memories will remember that I originally tested the Cel-Fi RS1, which was great, and then the RS2, which was even better and provided a higher throughput. Both

✓ The Cel-Fi Pro is a useful upgrade to the company's mobile smart repeater, adding 4G data

devices worked with 3G-capable phones. I've been testing the latest model in this line, the Cel-Fi Pro, for the past few months and it's a massive improvement over the earlier devices. Its headline feature is that it supports 4G – so if you're one of those unfortunates who normally settles for 3G or 2G, but can just about see 4G by standing on one leg near an upstairs window, then the Cel-Fi Pro is the answer. |

SIGNAL BOOSTING

Cel-Fi Pro boosts the 3G signal for voice calls (and for data if the 4G signal drops). Its twin boxes are smaller than the previous models and both have useful LCD screens that show you their status, and, with a secret button press, can also show many stats about the connection to the local 4G and 3G cell towers and the link between the two devices. This information can also be seen on your phone or tablet using a BLE link and a free app.

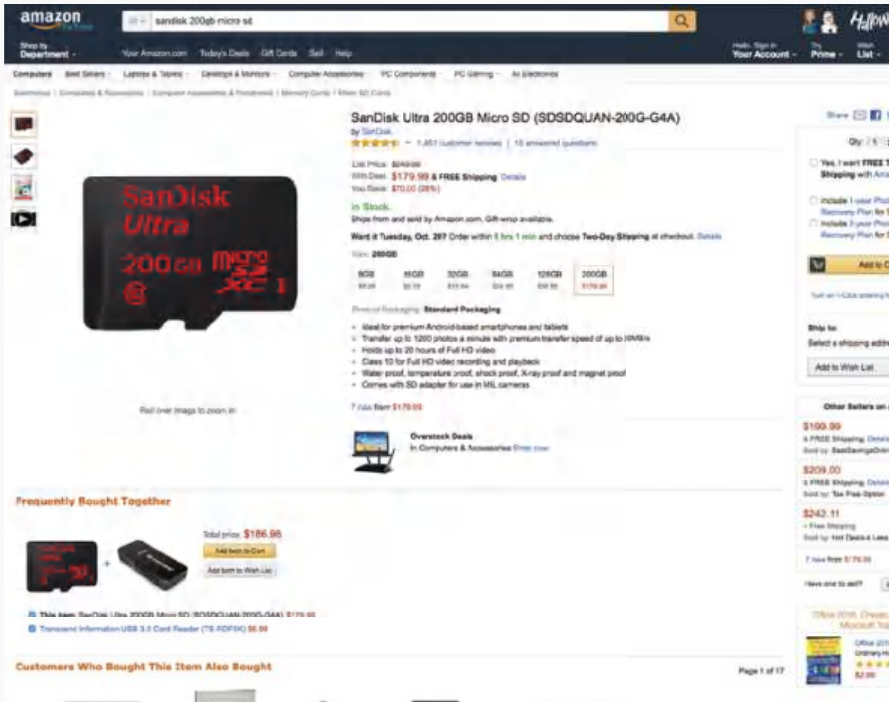
HOW IT WORKS

I mentioned that there are two boxes. One of them, the Window Unit (WU)



PAUL OCKENDEN

Paul owns an agency that helps businesses exploit the web, from sales to marketing and everything in between [@PaulOckenden](#)



^ So big and yet so small, SanDisk's 200GB microSD card is a marvellous feat of engineering

in Nextivity parlance, sits where you receive the strongest signal in your house or office – usually near a window – and its LCD screen has signal bars similar to that of a phone, which is useful for locating the best position. The second box is the repeater or Coverage Unit (CU), which has a 5GHz connection to the WU and repeats the signal received from the former, on the same frequency. Now, anyone with an engineering background will be screaming “feedback” at this point, because if the CU just re-radiates the same signal, what’s to stop the WU from picking up this as well as the original signal from the cell tower?

BOOSTING THE SIGNAL

This is where Nextivity’s IntelliBoost comes into play. By deploying a combination of filters, equalisation and echo-cancellation techniques, it creates a “bubble” of coverage that provides just as much gain as is possible without reaching the WU at sufficient strength to feed back. Consequently, the key when placing your CU is to maximise the size of this bubble – place the units too close and the CU will retransmit at such a low power that you’ll receive a boost only when very near to it.

Place the units too far apart and the 5GHz link between them will struggle to reach. The displays on the units show the quality of this link to help you.

PLACEMENT

Ideally, if you think of your building as a square, you’d place your WU close to one corner and then place the CU just over halfway across the space, to ensure the bubble covers all of the building. Of course, real-world sites are rarely such an ideal shape, so you’ll have to play around with the position of the units somewhat.

I mentioned a secret button press earlier: just hold down the display button on either unit for roughly ten seconds and you’ll see plenty of stats, most of which I don’t understand – perhaps explaining why the button press is secret.

I’ve been using the Cel-Fi Pro for several months and have been very impressed. The WU once decided to switch itself off and I had to power-cycle it, but except for this occasion, the

> The bandwidth demands of a NAS at home, whether streaming media or not, can usually be met with a good powerline adaptor if there’s no alternative

product has behaved flawlessly. I can’t recommend it highly enough to those of you who struggle with mobile reception at home or work.

Not only will you get faster downloads and clearer calls, you’ll also find that your phone’s battery will last longer, because the handset spends less time hunting for the best local tower and can reduce its transmit power to the lowest level.

FASTER, SMALLER, CHEAPER

That said, the device does breach my self-imposed “faster, smaller and cheaper” theme because, although it’s definitely faster with 4G and its boxes are smaller, at over \$1000, it’s \$400 more expensive than its older, 3G-only predecessor.

The older, cheaper devices are still available if you want to make only voice calls, but you really need the Cel-Fi Pro if you want five bars of 4G signal.

In an age where a family or small office might own a collection of several phones costing in the low-thousands, the cost of a new Nextivity box doesn’t seem excessive.

THE POWER OF DATA

Another “not-spot” scenario is when there are parts of the home or office that the Wi-Fi signal won’t reach. I’ve looked



at various solutions in the past, from upgrading the router or using a different network card to deploying a Wi-Fi repeater, all of which work well. However, if you want the fastest, most reliable connection – say, between a NAS in your office and a media streamer under your TV – then powerline networking may be equally good.

ENTHUSIAST INTERFERENCE

Before you consider this, have a wander around your neighbourhood to see whether any of the houses have large, unusual-looking aerials on their roofs, or on-tower structures in their back gardens. If so, those people are probably amateur radio enthusiasts and powerline networking kit may interfere with their hobby as it splats out signals on a wide range of frequencies – and your house or office wiring will act as a huge antenna because it won't be shielded. If you do see such antennae in the area, and want to stay on good terms with the locals, I'd suggest you avoid any form of powerline networking.

That said, the latest HomePlug standards minimise such interference by "notching out" the most popular amateur radio bands. Older kit didn't have such transmission notches and so created a bigger problem. Notches or not, powerline networking and amateur radio are probably best kept apart.

DATA CONSUMERS

I've been using HomePlug AV 500 kit at home for some time now, and although I obviously use Wi-Fi for a lot of stuff, I kept HomePlugs connected to my NAS and the small switch under my TV, into which devices such as my Sky box, Roku, Apple TV, the TV itself and various other gadgets are plugged. Another HomePlug sat next to my wireless router, with a final one connected to a Canon inkjet printer that sometimes struggles to receive a Wi-Fi signal. You can ignore the 500 in the AV 500's title since it's pure marketing speak – I got around 80MB/sec throughput in my "real-world" scenario.

BOTTLENECKS

As you may recall, I've recently moved across to 802.11ac for my wireless network, meaning the wired HomePlug components of my network suddenly became a bit of a bottleneck. When my MacBook was doing a Time Machine backup to the NAS, for example, the powerline connection meant that it wasn't going as fast as it could, and you all know what that means – time for an upgrade. The powerline device to which



> The PL-1200AV2-PIGGY has two Gigabit Ethernet ports

I chose to upgrade my network was the catchily named PL-1200AV2-PIGGY.

PLACEMENT

As you can probably guess from the name, these devices employ the HomePlug AV 1200 standard, and under my real-world conditions I find that they give me a shade over 200MB/sec.

As with all HomePlug kit, if both adaptors are on the same ring main then they'll give higher speeds than if, for instance, one is plugged into a downstairs socket ring and the other an upstairs ring. In my case, the path between both adaptors is via the CU (called a "fusebox" by the man on the Clapham omnibus), which will obviously reduce the throughput

CROSSING THE BEAMS

My older AV 500 HomePlugs were wider than these new Solwise units, and would partly obscure the neighbouring socket. However, there's no such problem with the PL-1200AV2-PIGGY, and it has the added bonus of a pass-through mains socket on the front (the PIGGY in its name stands for piggyback). Also,

unlike previous devices, there are two Gigabit Ethernet ports rather than one, which is useful.

Many users will be used to older HomePlug adaptors regularly locking up and requiring a power-cycle to get them going again, but I've been using these newer devices for a few months now and have had no such problems –

"Have a wander around your neighbourhood to see whether any of the houses have large, unusual-looking aerials on their roofs"

they've been totally rock-solid.

Also, unlike older kit that used just a single path over the live and neutral lines for signalling, these new Solwise adaptors can transmit on any two of the three pairs formed by live, neutral and earth lines. For the technically-minded, the PHY (physical) layer takes a single data stream and segments it into two independent bit streams, which are each transmitted across a different pair (automatically selecting the least noisy). The receiving HomePlug employs two separate receivers to grab these bit streams and recombines them back into a single stream.

MIXING STANDARDS

An AV 1200 device will co-operate with AV 200, AV 500 and AV 600 devices, although obviously at a lower speed. In practice I'd advise against mixing adaptors, however – if you keep your whole network on the same standard (and preferably with the same manufacturer and firmware version), you'll be in for a much smoother ride. And at around \$80 per adaptor, these aren't exactly expensive – certainly cheaper than the AV 500 adaptors I bought a few years ago.

A very recent arrival is the new D-Link DHP701AV, which may be to your liking, that's reviewed on page 44.

Overall, I've found this to be a really useful upgrade, since my "wired" network (I know that purists will flinch at that description) is now as fast as my Wi-Fi – and, best of all, it fits the theme of this month's column: faster, smaller and cheaper. ●



PROFESSOR ALAN WINFIELD

"WE DON'T NEED A MAJOR BREAKTHROUGH IN ARTIFICIAL INTELLIGENCE TO BUILD AN ETHICAL ROBOT"

Isaac Asimov's Laws of Robotics may be the stuff of science fiction, but robots can be made to act ethically using simple rules



Is it possible to build an ethical robot – one capable of choosing or moderating its actions on the basis of ethical rules? Three years ago, I thought the idea impossible, and said so in my book, *Robotics: A Very Short Introduction*.

I've since changed my mind. In fact, I've not only altered my opinion but, with colleagues, I've even implemented and tested an ethical robot. So, what brought about this U-turn? It wasn't an epiphany, but more a case of several ideas slowly coming together.

First came the realisation that robots don't need to be sentient to act in an ethical manner. In other words, we don't need a major breakthrough in artificial intelligence to build an ethical robot. A relatively simple robot could behave ethically not because it chooses to, but because it has been programmed that way. It would be an "ethical zombie" – capable of moral actions, without understanding what it was doing or why it was doing them.

The second idea came from thinking about very simple behaviour. Here's a thought experiment: imagine you're out walking and notice someone who isn't looking where they're going. They're heading straight for a hole in the pavement, but are wearing headphones and peering at their smartphone (not that this ever happens nowadays). You will most probably try to intervene. Why? It's not only because you're a good person, but also because you have the cognitive machinery to predict the consequences of their actions, and can act to avert the calamity.

Now imagine that it's not you observing the scene, but a robot that can perform

four possible actions: stand still, move straight ahead, move left or move right. From the robot's perspective, only two of these options are safe: stand still, or proceed to the left. If it goes straight ahead, it will fall into the hole. If it moves right, it is likely to collide with the human.

But, if the robot can model the consequences of the human's actions as well as its own, another possibility opens up: the robot could choose to collide with the human to prevent them from falling into the hole.

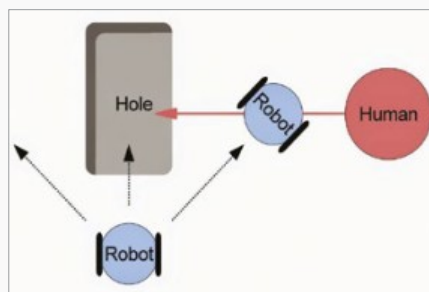
Here's a simple rule for this behaviour:

IF for all robot actions, the human is equally safe
THEN (* default safe actions *)
 output safe robot actions
ELSE (* ethical action *)
 output action(s) for least unsafe human outcome(s)

The rule aligns remarkably well with Isaac Asimov's First Law of Robotics: "A robot may not injure a human being or, through inaction, allow a human being to come to harm." The robot will generally avoid colliding with a human because it may not injure them, but may sometimes compromise the rule in order to prevent a human from coming to greater harm.

An idea, therefore, emerged that we might be able to build a robot with Asimovian ethics. To do this, we needed

✓ We tested the human-heading-for-a-hole scenario using the open-source 2D robot simulator Stage



△ We extended our e-puck robots by adding a Linux card – the circular green board above the skirt

to equip the robot with the ability to predict the consequences of both its own actions and those of others, plus some hardwired ethical logic – namely the IF-THEN-ELSE code above.

We then realised that the technology we needed to do this already existed. Moreover, it's mature and commonplace in robotics research – namely the robot

"First came the realisation that robots don't need to be sentient to act in an ethical way"

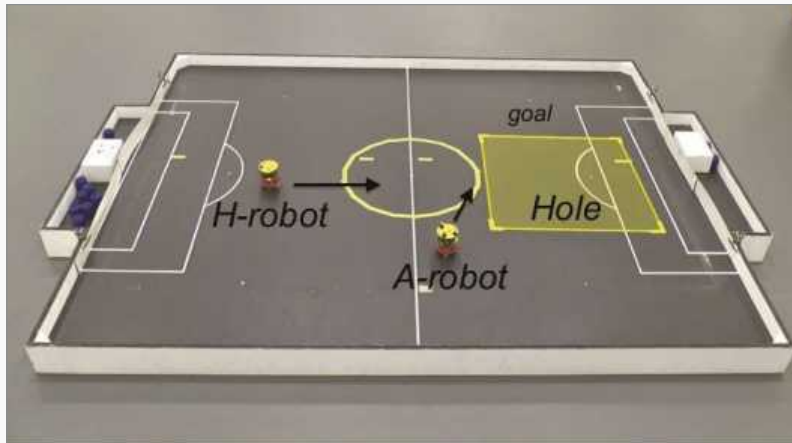
simulator, which provides developers with a virtual environment for prototyping robot code before running it on a real robot.

The idea of putting a simulation of a robot inside a robot is not new, but it is tricky – only a few researchers have pulled it off. It takes a bit of getting your head round: the robot would need to contain a simulation of itself and its immediate surroundings, including other things such as humans or other robots in its vicinity.

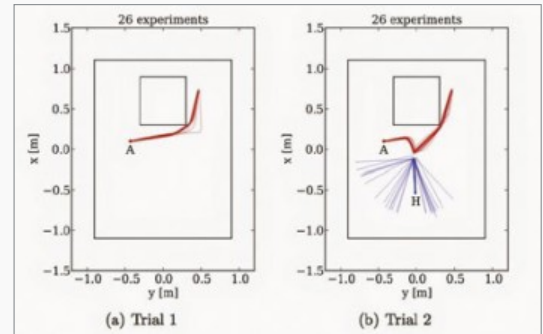
I was lucky enough to be able to present and debate these ideas with fellow researchers at several meetings in 2013, but they remained merely theories on paper. Then came a stroke of luck. In 2014, Christian Blum, a brilliant PhD student from the Cognitive Robotics group of the Humboldt University of Berlin joined my research group for six months. I suggested that Christian implement these ideas on our e-puck robots and, happily, he was up for the challenge. He succeeded. Christian, supported by my post-doctoral research fellow Dr Wenguo Liu, implemented what we call a real-time "consequence



PROFESSOR ALAN WINFIELD
 conducts research into cognitive robotics within the Robotics Laboratory at UWE



- < We told the A-robot where the virtual hole was and gave it a specific goal position
- ✓ These graphs show the paths taken by the robots, captured by our tracking system



engine"on the e-puck robot.

The e-puck is a Swiss mobile robot designed primarily for education and research. We've been using these robots over several years for swarm robotics research, and have extended them by designing a Linux card – a circular green board just above the red skirt (see picture, below right).

Running the open-source 2D robot simulator Stage as its internal simulator, our consequence engine runs at 2Hz. This means it can evaluate about 30 possible actions and their consequences every half-second, with the simulation budget allowing us to simulate ahead around 70cm of e-puck motion for each possible action. In fact, Stage actually runs on a laptop, and is linked to the robot over a fast Wi-Fi connection. But, logically, it's inside the robot. What's most important here is the proof of principle.

We tested the human-heading-for-a-hole scenario using two e-puck robots, with one running a consequence engine with an ethical rule (which we called the A-robot, after Asimov), and another playing the role of the human (the H-robot).

The image above shows what the experiment looked like – ignore the football pitch markings, which were from a previous robo-football experiment. As you can see, we didn't dig a real hole, but a virtual one, the yellow shaded square on the right, and told the A-robot where it was. We also gave the A-robot a specific goal position – at the top left – so that it had to actively avoid the hole. The H-robot on the right, acting as a proxy human, didn't see the hole and headed straight for it.

So, what happened? We ran two trials, with multiple runs in each. The first trial just involved the A-robot moving toward its goal while avoiding the hole. We introduced the H-robot in the second trial. The graphs (top right) show the paths taken by the robots, captured by our

"We wanted to see how our ethical robot handled a balanced dilemma"

tracking system, for each run in each trial.

In trial 1, the A-robot neatly clipped the corner of the hole on its way to the goal position. In trial 2, the A-robot initially set off on the same route, but then noticed that the H-robot was in danger of falling into the hole, and moved in order to head it off, which provoked collision-avoidance behaviour by the H-robot. Once the H-robot had been diverted safely away from the hole, the A-robot resumed its own progress toward the goal position. The A-robot was, therefore, 100% successful in preventing H-robot from falling into the hole.

We started to write up our results at this point, but needed something more than just an entry saying "we built it and it works just fine". Consequently, we introduced a third robot to act as a second human. So now our ethical robot would face a dilemma – which one should it rescue first? We thought hard about this question, and decided not to program a rule or heuristic to solve it. This was partly because such a rule should be decided by ethicists, not engineers, and partly because we wanted to see how our ethical robot handled a balanced dilemma.

We set the experiment up carefully so that the A-robot would notice both H-robots at about the same time. We also noted that, because these are physical robots, no two experimental runs will be exactly identical. The results were very interesting indeed. Out of 33 runs, the A-robot managed to rescue one or other of the H-robots 16 times. Amazingly, the A-robot rescued both three times. In these cases, the A-robot managed to rescue the first H-robot

quickly and had just enough time to get to the second before it reached the hole. Small differences in the trajectories of H1 and H2 helped here.

But perhaps most interesting were the 14 runs in which the A-robot failed to rescue either, even though there was clearly enough time to rescue one. When we studied the videos of our experiment, the reason became clear: the A-robot sometimes dithered. It noticed one of the H-robots, and started toward it, but then identified the other and changed its mind. The time lost dithering meant that the A-robot couldn't prevent either robot from falling into the hole. Is this the first experimental test of a robot facing an ethical dilemma?

So, I went from a sceptic to believer in three years, and ended up building a minimally ethical robot that – remarkably – appears to implement Asimov's First Law of Robotics.

As we noted when we published our findings, we're not claiming that our robot is ethical in any formal sense that an academic might accept. But even minimally ethical robots could be really useful. I think our approach has been a step in this direction.

Let me finish with a question about the ethics of ethical robots: if we can build an ethical robot, are we ethically compelled to do so? Some argue that people in the robotics industry have a moral duty to try to build ethical machines, and I agree. But are there associated hazards? Are we opening a kind of ethical Pandora's box by building robots that might have an implicit claim to certain rights? I don't mean that such a robot would actually ask for rights, but rather that, because it is some in-built moral agency, we might think it should be offered them. My conclusion, for now at least, is that we should try to build ethical robots: the benefits far outweigh any ethical hazards, which in any event could, I think, be minimised. ●



DAVEY WINDER

"AS CONTACTLESS PAYMENT BECOMES A SMARTPHONE REALITY, BIOMETRIC PROTECTION WILL BE A GAME CHANGER"



A move to Android now makes perfect sense, but choosing the most secure handset is less straightforward

I'm in the market for a new smartphone, and will be making the move from Apple to Android, after several long and mostly happy relationships with iPhones over the years. I don't want to upset the fanboys out there, but when my iPhone 5s contract expires next month, I can see no reason to upgrade to the new 6s, let alone last year's 6 or 6 Plus models. For me, the iPhone has become a little too static in technical innovation, and far too dynamic when it comes to cost increases. Given the wider range of choice in prices and functionality, a move to Android makes perfect sense. However, choosing a handset has been less than straightforward, because my requirements primarily revolve around security.

That shouldn't come as any great surprise to readers of this column, given that it's what I do for a living, but it does make things more interesting. The annual IFA Berlin show has just come to an end as I write, with a slew of smartphone announcements muddying the waters a little. One feature I do want, for which I can blame the iPhone 5s, is a fingerprint reader. Although this was thought of as more a gimmick than a serious security feature by many when it was announced a couple of years ago, the fingerprint reader on my iPhone has now become part of my life. Worries surrounding the insecurity of fingerprints, especially on a phone, appear to have been largely unfounded in my opinion.

However, I do see the irony in moving from what's known to be a very secure fingerprint-reading implementation on the iPhone to an apparently less secure one on Android devices. Apple's Touch ID creates geometric data points from a

fingerprint scan, which can't be reverse-engineered back into a fingerprint. This data is then encrypted and stored in a "secure enclave" isolated from the rest of the iPhone's processor and iOS memory. HTC, on the other hand, was found to be storing fingerprint scan data as unencrypted image files on the phone. But that doesn't mean that it hasn't learned from the mistake. Indeed, HTC had fixed the vulnerability before it was revealed at the Black Hat Briefings conference, and rumours of another potential problem – fingerprint scanners not being protected through isolation within the ARM TrustZone architecture – have also prompted the handset manufacturer to fix it.

Combining my fingerprint with a PIN code must be more secure than a code alone, and it's certainly more convenient when it can then be used to access day-to-day functions, after the PIN code has been entered at the start of a session. Anything that further locks down my phone against the casual criminal has to be a good thing, and it's the casual criminal who is likely to cause most of the problems, rather than some state-sponsored super-spy or a highly organised criminal gang. As contactless payment becomes available on more and more smartphones, this will become the arena where biometric protection is going to be a game-changer. Two of the features I'm insisting on for my new handset are a fingerprint reader and near-field communication (NFC) capability so that I can make payments like this.

This rather limits my choice at the moment because, surprisingly, there are relatively few devices that provide both of these features – plenty provide one or the other, but not both. Even fewer have a Qualcomm Snapdragon 820 processor, as this chip hasn't arrived yet. I may wait for it, as the security advances it brings are rather interesting. In particular, it's the first processor platform that comes with "smart protect", which promises to

provide on-device, machine-learning-based zero-day malware protection in real-time – an over-hyphenated mouthful that means there'll be an advanced cognitive behavioural engine built into the chip that will perform "deep on-device monitoring" against malware. Obviously, this is all still at the press release and marketing stage, and we'll have to wait to see how it works in the real world, but it's definitely something I'll be keeping in mind – maybe for my next upgrade, though.

Going back to fingerprints, although not in the scanning sense, I can't help but think there's a trick that should be made available to everyone as a stock Android function: PIN scrambling. This is already in CyanogenMod 11, and Cyanogen OS as deployed on the OnePlus 2 (see p37 for our full review), as well as in apps such as the XBlasT Tools module for Xposed users in the Android world, and CodeScrambler for jailbroken iPhones. It does exactly what it says on the box, and here's how it works: you use the same PIN every time you unlock your smartphone, or activate a locked-down app, but using a different PIN pad each time. It's a small thing that can create a big obstacle for anyone who wants to steal your stuff. I'm talking about the sort of person who has regular physical access to your phone but not the code to get into it, and who understands that, if they watch you long enough (and it doesn't take that long), it's easy to deduce your PIN from the pattern of your finger movements. Randomising the order of the number pad means that technique won't work any more, and neither will the more opportunistic PIN-hacking method of inspecting the pattern of screen smudges to guess the PIN.

ROUTER MADNESS

Sometimes I feel like I just have to state the obvious, and this is one of those times: please change your router's admin credentials from their defaults. I've just finished talking to a client of mine whose business was interrupted by a



DAVEY WINDER

Davey is an award-winning journalist and consultant specialising in privacy and security issues. [@happygeek](#)

loss of connectivity that ended up being traced back to a malicious visitor. Well, I say malicious visitor, but mean bored teenager. The school holidays have finally finished and my client will be pleased about that, as it was a friend of his son who took it upon himself to apply parental filters to the office router during an unsupervised visit, and only allow internet access for three hours a day.

My client's first mistake was allowing any visitor into the office without supervision, even with a blood relative. The second, which compounded that initial error, lay in not changing the default admin login credentials of the office router. I'm amazed at how many times I come across this simple error in small offices where there's no IT support and the router has been upgraded or installed by some enthusiastic hobbyist. I could understand it if these were hard-coded credentials that the end user can't change, but they weren't: I'm talking about the admin login that should be changed right from the get-go. This particular chap was lucky that it was a bored teen and not a malicious employee with a grudge, who could have done some real non-traceable damage, such as by setting up custom DNS configurations to poison the local network name resolution, or installing malware-infected firmware.

If you don't think that router security is a big problem, spend a little time on Google searching for the passwords for your router model. Or how about diving a little deeper into the murky waters of security research where you'll soon discover sites such as Routerpwn, which will tell you how to exploit just about any badly secured router on the market. The information is out there for anyone who wants to find it, so the very least you can do is make life difficult for them.

TIME TO SAY GOODBYE

Regular readers will know that I'm not a great fan of Adobe Flash, and that's putting it mildly. As someone who walks the IT security beat, I've been analysing and reporting on insecurities related to Flash for the best part of nine years now. The CVE Details website (cvedetails.com), which has kept track of security vulnerabilities across the years, lists no fewer than 545 vulnerabilities for the Adobe Flash Player in its database. These issues stretch right back to 2006 with CVE-2006-3311, which related to a buffer overflow in Flash Player 8.0.24 and earlier that enabled user-assisted remote attackers to execute arbitrary code via a long, dynamically created string planted within an SWF movie. Similar stories have unfolded every year since, and I first started calling for people to stop using

Flash in 2009, a shout that's become louder over the past few months, when I went as far as declaring that users should kill off their Flash Player because "it's useless, you don't need it and you won't miss it".

At the risk of oversimplifying this thorny issue, I'd say that, while some sites do still demand Flash to run their videos, these are generally advertising-related videos that we can all get along just fine without. Anyway, most sites that serve up Flash also have an option to serve that same content via HTML5, to ensure iOS visitors don't get turned away. Therefore, it's pretty easy to spoof your browser, via the User-Agent string, into thinking that you're using iOS in order to receive the HTML5 version by default.

I've been putting my money where my mouth is by removing Flash Player from my browsing experience, and did I notice anything other than a feeling of relief that this insecure remnant of the 1990s was out of my online life? Nope, nothing at all. So I felt a sense of

"The fingerprint reader on my iPhone has now become part of my life"

security achievement when I discovered that Chrome had followed my lead by blocking Flash from 1 September, and that Amazon had placed a blanket ban on Flash ads from the same date. This wasn't done to improve security, but such an improvement is certainly a side effect and that's good enough for me. Apparently Google was looking to reduce the runtime overhead and performance hit, rather than the attack-surface exposure, so it's introduced a "click-to-play" system for videos by default. While Flash hasn't been banished altogether, it will feel that way for most people, most of the time – sort of.

Why "sort of"? Well, the new system only actually applies to adverts and doesn't impact upon Flash content such as games. To me, that looks like a missed opportunity and it would have been better all round (other than from Adobe's perspective, of course) if a "do not activate" flag had been set by default rather than a "click to activate" one that still allows Flash-serving sites to serve Flash in preference to HTML5 – on the basis that the browser supports it, and the user may well click and get the content anyway. At least Google is automatically converting AdWords adverts into HTML5 now, and actively blocks Flash in that respect – so the message is starting to get across that Flash is terminally ill, if not

quite dead yet. Personally, I'd recommend that you follow my lead and get rid of it in Chrome by typing `chrome://plugins` into the address bar and then hitting the "disable" link next to the installed Flash Player entry.

Flash isn't the only insecure dinosaur to be facing in-browser extinction, as it looks like the RC4 cipher is also finally getting the chop. It's had a pretty good innings, close to three decades in fact, but on 1 September (yes, the same day) Google, Microsoft and Mozilla hammered a few nails into its crypto-coffin. Although the exact date of death isn't yet known, Microsoft says that, "starting in early 2016", RC4 will be disabled by default in both Microsoft Edge and Internet Explorer 11, and will no longer be used during TLS fallback negotiations. This is a good thing, as almost every security expert I know agrees that RC4 is now obsolete and must no longer be considered cryptographically secure. However, while everyone knows what Flash is, you might not be so familiar with RC4 – so what is it?

Simply put, it's a "stream cipher" that encrypts data in transit between web servers and clients on the fly, to protect the HTTPS-connected traffic from being spied on. That was the theory, and had been the practice for a long time – until holes were discovered in it a few years ago. The final straw came when, as part of the Edward Snowden revelations, it was suggested that intelligence agencies in both the UK and USA had been able to break RC4 encryption for some while. Despite knowing certain security experts who are still in denial about how broken RC4 is – at least as far as spies being able to crack it at will are concerned – I'm not in their camp. RC4 really is broken to bits, no pun intended, with researchers and attackers alike showing that the RC4 keystream can be compromised in a matter of hours, or days at most.

The Internet Engineering Task Force (IETF) prohibited the use of RC4 with TLS at the start of this year, and Cisco has recently changed its status from "legacy" to "avoid". And so we find ourselves in the happy situation that the big browser boys are forcing the hand of the folk who have been clinging on to RC4, making them move to TLS 1.2 instead – something most people have already done anyway. This is nothing new, since Microsoft has been recommending the removal of RC4 and the enabling of TLS 1.2 for at least two years now. If your business is one of the few that's clinging on to RC4 – Google reckons 0.13% of HTTPS connections still use it, while for Mozilla it's about 0.08% – I'd suggest you act now as, come the spring, most browsers won't be able to make a connection to you otherwise. ●



STEVE CASSIDY

"I SUDDENLY REALISED THAT HE WAS READING WHAT IT SAID ON MY FLEECE. IT HAD THE MICROSOFT LOGO ON IT"



A chance encounter in a restaurant in Germany highlighted that scam calls are now becoming exquisitely accurate

He was exactly the type of person I normally go out of my way to avoid: talking too loud while in a foreign country, a couple of local beers past his best, and accompanied by a group of people he did his best to amuse by repeatedly reminding them they were in another country – reading out the signs on the restaurant wall, on the menu or on anything else that contained a word that might have sounded funny in English. Once. In 1947.

As if that weren't deterrent enough, he was evidently a sole trader who had redirected his home phone to his mobile number so that no vital call went unanswered. Don't imagine that he had a subtle, polite ringtone – oh dear no, it was a recording of his dog (possibly a pitbull) barking. Being abroad among "furriners", he was irrationally worried by the risk of theft and so kept his phone in a zipped pocket, meaning every new call was heralded by at least 16 of Fido's best barks while he fumbled around in his jacket, found the zip and juggled the phone for a few minutes.

By the middle of my meal, I was considering getting my headphones out – even though I'd left my iPod in my rucksack back at the hotel. But eavesdropping is inevitable, almost compulsory, in such circumstances, and so this is what I heard: "Oh yes, Microsoft? Yes, you spoke to the wife last week. No, she won't touch the computer, but thanks for ringing back. No, mate, nowhere near it – I'm in Germany, see – could we make an appointment for next week? Actually, hang on a sec, would you Adam and Eve it, I can see one of your blokes sitting right across from me!"

His face lit up with surprise at this slightly drunken opportunity and, more horrifyingly still, he looked directly at me, sat across the walkway. I suddenly realised that he was reading what it said on my fleece, which I'd grabbed from the back seat of my car in the unseasonably cold weather. It had the Microsoft logo on it. He had the lopsided grin of a hunter who has discovered the hiding place of an exhausted fawn. Holding his phone out to me, he said: "Here mate, some of your colleagues on the phone! Naaaaar-r-r-r-rr!!" (mere typography cannot adequately represent the indecency of his curious laugh). And that was when I realised what his call actually was.

Remember, this charming chap had redirected his home landline because it was an advertised number related to his trade, and he didn't want to miss any work orders while on holiday. Let's pass over whether or not this is a productive strategy, given his habit of answering calls while three sheets to the wind; it also meant that even unsolicited calls would still set that damn dog a-barking, including scam calls from fraudsters pretending to be Microsoft security and claiming they've detected a fault on your home computer.

I keep a little portfolio on these scammers. Only twice have I managed to arrive during the sequence of

calls and software installations they employ to hold the target's PC to ransom. I was too late the first time because their intended victim had already been too smart for them, while the second occasion was perfectly timed, but for the harrowing reason that their victim was only at home to take their call because she was undergoing chemotherapy. She was very understandably off-form, allowing their scam to run far enough for me to get a handle on where the remote-control session was coming from, and what they'd done to her machine.

The guy leering at me across this German restaurant was in a very different category: it sounded as though the scam was still in its very earliest stage and, although my immediate impulse being to run screaming down the street as far away from this guy as possible, I realised that I could add another data point to my dossier. So I took the phone out of his hand. He really wasn't expecting this, and I figured I might only have time to say a few sentences before he decided that getting it back might make a top-flight comedy sketch for his audience. However, I was fascinated and enthralled by the prospect of first-hand contact with the scammers, and Edgar Allen Poe's Imp of the Perverse is never far away from me, so I said:

> The fleece that was the eventual undoing of the fake Microsoft caller



STEVE CASSIDY

Steve is a consultant who specialises in networks, cloud, HR and upsetting the corporate apple cart [@stardotpro](#)



"Gates here."

"Yes, hello sir, can you tell me if Mr [X] has his laptop available?"

Okay, my opening jest had fallen flat thanks to the scammer's pure ignorance. And, worse still, not only was Mr X without his PC, but so was I – leaving me unable to go through their install process. I definitely didn't want them calling him back because, despite my snobbish disdain for him, I was pretty sure he wouldn't be able to resist following their instructions. They were clearly on the scent of fresh meat.

"No, I'm afraid he doesn't. I was just sitting across the restaurant from him with a few of my Microsoft colleagues and he saw my gold lapel badge."

I thought I'd lay it on thick, and give thanks that video calls are not yet the norm on mobiles.

"Gold badge, sir?"

"You know how it is. I'm proud of the company, but I don't like to make a big thing out of it everywhere I go."

"Sir? Are you near a laptop?"

"No, you don't seem to understand. Mr X is travelling, and has redirected the phone you called. We are in a Chinese restaurant in Germany."

"Oh I see, Mr Gates [so the joke wasn't entirely lost then]. Can you ask him when it would be convenient to call him at home?"

Having initially succumbed to the Imp, I found myself in thrall to a rather less jocular impulse at this point in the conversation – one that gives the scammers a taste of fear. Nothing more revealing was likely to arise from this particular exchange, so I changed tack and said:

"Actually, it would be so much easier

^ Scammers buy and sell lists of vulnerable people, collected from a host of sources

if they called you. What's your building number at Redmond? I'll set the call up."

"Redmond, sir?"

I can't recount my next remarks verbatim because they included an exceptionally nasty word starting with "M". So, to paraphrase, I told them that I knew their game, and that I would be exposing them and their methods to as wide an audience as I could muster. I also suggested that they delete the chap's number from their call database and never, ever make contact with him again. Very satisfyingly, they immediately hung up – leaving me the task of explaining the whole scam to a drunk who used a barking dog as his ringtone.

The problem with scam calls is that their targeting is becoming exquisitely accurate. Scammers now buy and sell lists of vulnerable people, collected from diverse sources, including slightly inattentive fundraisers in charities, credit-control agencies and bored local-government workers looking to make some unofficial drinking money. These are all jobs in regular contact with people who leave a trail of information in low-security databases, marking them as being easy to persuade. The horrible truth for snobs like me is that, unless we put our heads together and help these people as much as we can, the scammers will be encouraged, demand for data on "vulnerable people" will continue to rise, and so will the calls.

My conversation with Mr X didn't go well. Involving me in his call hadn't worked out as he'd expected, making him angry and obstructive. The

idea that I was walking around with Microsoft written on my jacket, but didn't actually work for them, was hard for him to swallow – as was the idea that Microsoft never rings domestic customers like that. As we spoke, he kept mixing up "scammer" and

"“I thought I'd lay it on thick and give thanks that video calls are not yet the norm on mobiles”"

"scammer", and he insisted that it must have been a real call because he's got "good antivirus" and never opens any dubious emails. He pointed out that they had a calling line ID from within the local area – successfully redirecting his home phone had made him a telephony pundit in his eyes – and was torn between agreeing that a misrepresentation could be possible, while also asserting that "Microsoft wouldn't do that". I pointed out that practically every large business plays fast and loose with voice-call routing these days – and fell into a trap: "So you agree, it is Microsoft then!"

Not for the first time, I concluded that I might not possess the right type of personality to don this particular superhero's cape. I see that Barclays prefers to talk about its "Digital Eagles" programme, rather than discuss consumer marketplace banking, and I suspect that they have the right idea. Information about how computers fit into the life of the home user needs to be purveyed by non-challenging, non-guru-looking people, possibly on a volunteer basis. I know that Ross Marven, the long-suffering computer support man who I know well, spends almost all his time unravelling matters that are more procedural (Yahoo password recovery) than technical. This style of support is currently so disorganised that the scammers retain the initiative – much more needs to be done about this problem, even if it means helping people we nerds don't like.

I should pay tribute to the response of my clients, the firm who helped the lady undergoing chemotherapy with her scammers. Without delay, they immediately provided a replacement laptop, fully patched to the then-current security state of Windows 7 and with their corporate suite of applications and antivirus. This allowed me to inspect her nasty old Vista PC exactly as the scammers had left it, and ensured that she could sit at home without further



upset or distress. This is what social responsibility looks like.

YOU CAN'T GET THE STAFF

How did I come to be sitting in the Chinese restaurant in Cologne, pretending that my last name was Gates? I was on my way to Switzerland, of course, to do battle with a completely unexpected source of grief and support calls – the Swiss power grid. If you think of a byword for reliable, consistent service, then the Swiss power grid might be high up your list: electric trains, cable cars, heated everything, and all those high-mountain valley hydroelectric power stations. In reality, such dependence on all things electric produces a bit of a conundrum because, once you're on those hills, the capacity of the thin air to cool your kit – which is often under pressure even in server rooms at sea level – drops by 20%.

Indeed, you suffer from an accumulation of adverse factors: spikes in the power supply as a cable car winch stops and starts 120 times a day; bumps in the supply due to demand at one end of a 75km mountain pass with a single line of pylons; and even more bumps because machines manufactured in the last decade are being stretched beyond their limits by managers who turn up once a year to say: "Ah yes, cloud is coming soon."

My answer to all of these problems has been to mount a steady process of virtualisation. You only need to go one generation newer than the very hottest and hungriest servers to find that idling power requirements fall by huge amounts, with 80% not being unknown. If only I could report the same level of benefit from market forces in the UPS business! While you can cloud-monitor your routers, heating, baby's cot, car and even your children, you still can't command and control even a large UPS from your smartphone. This seems mad in larger businesses (which is what UPS gurus design for, naturally), but it would make a lot of sense in smaller



ones – especially if you're high up in the mountains, and probably out for a beer with the guy who just cut you off for the next six hours. You could make an informed decision and do a nice polite remote shutdown, because the power won't be coming back any time soon.

I can hear your splutters increase in volume: "Steve, surely UPSes have had smart shutdown capability for years?" Well yes, indeed they have, but sadly

"You still can't control and command even a large UPS from your smartphone"

there's nothing to stop UPS and server software designers making a perfectly sensible solution a whole lot nastier. To save you gawping into your search engine, I'll summarise: if you want to make a tidy shutdown for a small-business user of VMware vSphere ESXi free edition, you'll need to put together a dedicated Linux-based helper VM, add some patches to the hypervisor kernel and write a few scripts. However, whatever you do, don't move the USB lead to your UPS onto a different USB socket on the back of your server. I conservatively estimate this to be about a week's worth of research, labour, testing and implementation.

Of course, you could hack around it by making the UPS talk over the LAN and by using any of the Windows-based UPS control and monitoring suites, but have you seen the price of LAN-connected UPSes? This whole sector is trapped in a weird pre-Raspberry

^ The Swiss power grid is far from the byword for reliability you would expect

Pi space-time continuum. A little bit of electrical control, married to some simple instructions to stop or start a server, gets buried beneath bloated or commercially motivated layers of obfuscation. The go-to site is Network UPS Tools (networkups.org), which, while showing all the signs of a classic open-source crowd project, still carries with it many megabytes of software – all sitting around idly to handle just one tiny event with one simple outcome.

Of course, there's a relatively easy way around this whole problem. You could turn up with the largest UPS you can lay your hands on, and make a bet that one-sixth of the power draw (by the server) plus six times the capacity (from the UPS) will multiply up more than enough runtime to ride out things such as avalanches or summer thunderstorms, without triggering an interruption long enough to become a problem.

In practice, the upside of their old-school database is that, provided there are no actual live transactions in progress when the server does finally die, the chance of corruption has proven to be infinitesimal.

Or, if you want to look at it another way, you can't have any open transactions if all your client workstations are themselves down through lack of power. I'm sure someone has by now figured out a neat hardware hack to get around this problem, and I await a Raspberry Pi-based UPS controller with interest. ●





TURNBULL CONVENES INNOVATION ROUNDTABLE

Replicates economic mini-summit for tech sector

Prime Minister Malcolm Turnbull joined colleagues and business leaders at an innovation roundtable at Western Sydney University.

Other political attendees at the October 16 event included Industry and Innovation Minister Christopher Pyne, Assistant Minister for Science Karen Andrews, Assistant Minister for Innovation Wyatt Roy, Senator Arthur Sinodinos and the local federal MP Fiona Scott.

Turnbull used the occasion to highlight the importance of innovation to Australia's future prosperity. "If we are going to remain, as we must, a high wage generous social welfare net economy, a prosperous economy, then we have to be more competitive, more productive more innovative," he said. "The opportunities, whether they are given by technology or by the enormous opportunities from a growing global economy, are all there. "Our ability to take advantage of them is limited only by our own imagination."

Pyne said the roundtable was effectively an innovation-focused version of the mini-summit the Government convened a fortnight ago with business and economic leaders. "This is a similar kind of approach," he

said. "The Government wants to listen, not just assume it knows every answer before everybody else does and draw as many people into this great crusade around innovation as possible. "For the future of the Australian economy we'll always have the bedrock of agriculture and mining and manufacturing but innovation, creative industries, start-ups, new technology, these are the new economy and Australia has the intellectual capacity to make the most of that."

Pyne said the Government would announce "an agenda around innovation and science... towards the end of the year". He believed that agenda would "unleash... ideas" that could be commercialised and "enable people to feel they can take risk."

WSU backs innovation shake-up



The venue – Western Sydney University – has been in the news over the past week, owing to its vice-chancellor Professor Barney Glover's October 7 address to the National Press Club on the role of the tertiary sector in fostering innovation. Glover – who is also the chair of Universities Australia and spoke under that guise – said in

"The Government wants to listen, not just assume it knows every answer before everybody else"

his speech that there appeared to be bilateral support for innovation among Australia's two main political parties. "Both major political parties have decidedly planted their feet firmly in the future," Glover told the National Press Club. "We can all hold out hope that the next federal election campaign will be an optimistic contest of ideas rather than a negative battle of wills and ideologies."

Glover indicated his belief that "the community is prepared to sign-up to the positively framed vision emerging from Canberra." "But what does this brave new agenda mean for Australia's leading enablers of innovation, its universities?" he said.

Glover used the rest of his speech to unveil a policy statement by Universities Australia called 'Keep it Clever', which he then backed in his role as vice-chancellor of Western Sydney University.

The statement calls on the Government to, among other things, "bolster initiatives to increase researcher mobility between universities and industry", increase funding and create tax incentives for businesses to push R&D through the tertiary sector.

"Our policy statement calls for a radical re-think and commitment from Government to create the conditions for innovation and prosperity to flourish," he said.

"But with Government, universities, industry and the start-up community seemingly in furious agreement on what's needed, we may be confident not only that we will get through this period of change, but rather that we, as a society will adapt and evolve in a way which benefits us all."

For more content like this, do please visit the ACS Information Age website at <https://ia.acs.org.au>

JON HONEYBALL SEES A FUTURE WHERE AUTONOMOUS CARS SAVE US FROM OUR COMPLACENT SELVES

“ I passed my driving test in 1981. In the 33-year time frame since then, vehicles themselves have moved on in an incredible way.

Back then, the anti-lock braking system (ABS) was a new thing available on only the most expensive of cars. Airbags were just as rare, while the early crash-testing of cars highlighted the complete horrors that were being sold to unsuspecting customers every day.

Today we have radar-based cruise control that can fire the brakes or perform an emergency stop without the intervention of the driver. The crash-testing and, most emphatically, the computer-based modelling of car structures, means the overall “crashworthiness” of cars is incomparable to those produced in the 1970s and 80s. Air conditioning is now a common feature, so the old-style fogged-up cars are a thing of the past. Even the arrival of laminated glass has had a significant effect, and I could rant on about LED lighting and even laser-guided headlights too.

Why am I pointing all of this out? It's because the standard of driving is getting worse. We rely on these systems, meaning driving has turned from an exercise that required effort, both mental and physical, to something almost automatic. I used to be as guilty of this as everyone else: my commute of ten miles to the lab had turned into something where I could completely tune out, listening to the dulcet tones of Phillip Adams on ABC Radio National. I would often arrive at the lab car park with little or no memory of the journey I had just completed.

This worried me a lot. I decided to do

something about it: to get my motorcycle licence. This was revelatory, and now I thoroughly enjoy riding my motorbikes both for work and pleasure. I would strongly argue that on a bike you need to have a vastly higher level of awareness of what is going on around you, both in terms of other vehicles and the environment – that is, the road surface, weather and lighting. This is necessary because you will end up in an accident otherwise, and on a motorbike (or pushbike) it is you who will get hurt.

“Getting disinterested and distracted drivers into self-driving cars will have a positive impact on the roads”

We two-wheeled riders have a term for the zoned-out car driver: such a road-user is called a SMIDSY, which stands for “sorry mate I didn't see you”.

ZONED OUT DRIVERS

So how does this impact on car driving? Well, I admit I have some quite radical views about zoned-out drivers these days. That's especially true for those who decide to read their emails, have a phone held on their ear, or even read a book propped up against the steering wheel. Or do their makeup in the rear-view mirror.

The statistical reality is that these are probably at least half of the drivers on the road, given the shape of a standard normal distribution curve. These are the ones who are not awake or aware, and can allow themselves that luxury

because cars are now so safe. I read somewhere that Volvo is aiming for no-one to die in their cars as a result of an accident in 2020. This is a staggeringly ambitious target to aim for, and I applaud them for it.

However, the sooner we can get to workable autonomous vehicles, the better for everyone. Getting those disinterested and distracted drivers into self-driving cars will have a hugely positive impact on the roads. Safety would increase, and it's quite likely that throughput per mile could be improved too, because an autonomous car could drive at the correct speed for the conditions.

In the future, it's possible that such vehicles could recognise each other, and go for a closer packing on the road. We might even see an end to the middle-lane hogger, who simply doesn't care about having any semblance of lane discipline.

Active driving will be left to those who can actually be bothered to spend effort both in the activity, and in the ongoing, regular training that should be brought in to back up the licence – a licence, incidentally, that should require a test every five years. After all, with an autonomous car, the driver should have no need of a licence, or even insurance. And I can't help but look forward with abject glee to the wholesale filleting of the insurance industry that is to come.

But a nagging thought still plagues me: will the future SMIDSY, “sorry mate I didn't see you”, just transform into a robotic voice that the car shouts out, instead of the driver, as it sideswipes a cyclist or biker?

Oh dear, maybe this won't be progress after all.



Level 6, Building A, 207 Pacific Highway,
St Leonards NSW 2065
Locked Bag 5555 St Leonards NSW 1590
Chief Executive Officer David Gardiner
Commercial Director Bruce Duncan

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EDITORIAL

Group Editor: Ben Mansill:
bmansill@nextmedia.com.au
Art Director: Tim Frawley
Digital Editor, Tech and Gaming:
David Hollingworth:
dhollingworth@nextmedia.com.au

REGULAR CONTRIBUTORS

Jon Honeyball, Paul Ockenden, Davey Winder, Steve Cassidy, Sasha Muller, Darien Graham-Smith, Nicole Koble, Tim Danton, Jonathan Bray, Bennett Ring, Anthony Caruana, Daniel Wilks, Mark Williams, Rob North, Peter Gutierrez

PRODUCTION

Advertising Coordinator: Sinead McCracken
Production Manager: Alison Begg
Circulation Director: Carole Jones
Printed by: Bluestar WEB Sydney
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ADVERTISING

Phone: (+61 2) 9901 6348
Group Advertising Manager Tech & Gaming:
Cameron Ferris: cferris@nextmedia.com.au
Account Manager Tech & Gaming:
Sean Fletcher: sfletcher@nextmedia.com.au

SUBSCRIPTIONS

1300 361146
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